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THE INFLUENCE OF GEOGRAPHIC ENVIRONMENT.

Perhaps there is no one thing which affects a primitive people to so great a degree as the character of their geographic environment; that is to say, the topographic character of their country and its climate. This has been shown repeatedly in the history of the world, but never more clearly than in the case of our Pueblo Indians, who have been located since their discovery in 1539 and conquest in 1540 by the old Spanish conquistadores in what is now New Mexico and Arizona.

Inherited ideas, habits and customs, mythology, and social systems, all affect a people, but they act through and upon the physical environment, and are eventually modified by it. So the stone-built houses of the Pueblos, in themselves the picture of unchanged adherence to an inherited type, are, in point of fact, the direct product of the country where they are found, and reflect its peculiarities. The systematic study of the southwestern ruins pursued by the Bureau of American Ethnology for fifteen years, the results of which are now becoming available, has demonstrated clearly the close accord which existed, and still exists, between the pronounced topography of the mesa country, or the plateau country, as it has been termed, and the highest type of art in architecture attained by the aborigines within the limits of what is now the United States.

The ancient Pueblo culture was so intimately connected with and dependent upon the country where its remains are found, that is, the plateau province, that a map of the latter, slightly extended around the margins and a little more to the south, would serve to show the former. The area of the pueblo country is about 150,000 square miles; that of the plateau country about 130,000. On the north it reaches to Great Salt Lake, on the south it extends over

the Gila River and beyond the limits of our country. On the west the Grand Canyon of the Colorado bounds the region, while on the east it extends a little beyond the Rio Grande and the Pecos.

The plateau region is not, as its name might imply, a smooth and level country; on the contrary, it is extremely rugged and broken, and travel is more difficult than in many mountain districts. It is a land of cliffs and canyons, often of great magnitude and always abundant, forming serious obstacles to wagon travel in any direction. The whole surface, apparently smooth and level, is composed of platforms or mesas. There are mesas everywhere; it is the mesa country. The flat tops of the plateaus are cut and seamed by gorges and narrow canyons, often impassable to a horse. Except along a few routes which have been established here and there wagon travel is difficult, and not infrequently the explorer is compelled to send his wagons fifty or sixty miles around to reach some point not twenty miles distant.

To the traveller in the valley the country appears to consist of sandy plains, bounded in the distance by rocky cliffs. From the summits of the higher plateaus he looks over a landscape of undulating surface broken by low wooded hills. But from the mountain tops he looks down upon a land everywhere cut into a network of jagged canyons—a confused tangle of cliffs and gorges without system.

The topographic features of the region are due to its geological peculiarities. It is doubtful whether anywhere could be found single formations which preserve their characteristics over such immense areas as here; and this, together with the apparently horizontal position of the strata, gives a peculiar monotony to the landscape, a sameness which appears to extend for hundreds of miles. But although the strata appear to be horizontal, they are, in fact, slightly tilted. The inclination, although slight, is persistent, and the thickness of the strata remains remarkably constant. Hence it comes about that the beds extend from high altitudes to comparatively low ones. Each formation appears as a terrace, bounded on one side by a descending cliff, carved out of the edges of its own strata, and on the other by an ascending cliff formed of the edges of the strata which overlie it. This is the usual form; but isolated mesas—bits of table-land completely engirdled by cliffs and standing up out of the valley like huge single rocks—are but little less common. The courses of the margins of the mesas are very irregular. The cliffs sometimes maintain an average trend through many miles, but in detail their

courses are extremely crooked; they wind in and out, forming alternate alcoves and promontories in the wall, and frequently they are cut through by valleys, which may be either narrow canyons or interspaces ten or even twenty miles wide.

The whole region has been subjected to great displacements, both folds and faults. Some of the flexures attain a length of over 80 miles and a displacement of 3,000 feet, and the faults are of even greater magnitude. There is also abundant evidence of great volcanic activity in the past, and although the principal eruptions have occurred about the borders of the province, traces of lesser disturbances can be seen everywhere throughout it. The oldest eruptions do not go back of Tertiary time, while the most recent are said to have occurred within the historic period—that is, less than four centuries ago.

The plateaus are cut here and there by high ranges of mountains, which afford some relief to the eye of the traveller wearied by the eternal monotony of the plains. These high mountain districts are characterized by a growth of giant pines, with firs and spruce in the highest parts and many little groves of scrub oak. The comparatively regular spacing of the great pines, and the entire absence of underbrush, give a certain park-like aspect to these regions. Going downward the pines merge into pinyons,* useful for firewood, but almost valueless as timber, and these in turn give place to junipers and cedars, which are found everywhere throughout the foothills and on the high mesa lands.

But the prevailing aspect is that of a timberless region. Miles upon miles of the flat country, the valleys and great plains, and the low mesas which bound them, are entirely destitute of trees. The monotony of the landscape is aided rather than diminished by the vegetation, for this, like the human occupants of the country, has come under its overmastering influence. The vegetation of the valley regions consists only of sage brush and grease-wood, with a scanty growth of grass in favorable spots, and the characteristic view is a wide expanse of featureless plains bounded by far-off cliffs in gorgeous colors; in the foreground a soil of bright yellow or pearly grey; over all the most brilliant sunlight, while the distant features are softened by a blue haze.

For a few weeks in early summer the table-lands are seen in their most attractive guise. The open summits of the mesas are clothed with a carpet of verdure almost hidden under a profusion of flowers. The grey and dusty sage takes on a tinge of green,

* *Piñon, nut pine.*

and even the repulsive greasewood conceals its spines beneath a cloud of golden blossoms. Cacti of various kinds vie with each other in producing the most brilliant flowers, odorless but gorgeous. But soon all this brightness fades and the country resumes its dreary aspect.

The rainy season comprises most of July and August, and sometimes part of September. During this periöd sudden heavy showers of short duration are frequent, and the thirsty soil absorbs a considerable share of moisture; but most of the water very quickly finds its way into deep-cut channels, and then, in heavy torrents, it is carried to the great canyons of the Colorado and its tributaries. The region, therefore, is not so well favored in the matter of water as even its small annual precipitation would imply, for, coming as it does all at once, more than half of the water is carried off directly from the surface of the ground and does not percolate through it.

The direct dependence of the savage on nature as he finds it is nowhere better illustrated than in this region. In the three essentials of land, water, and vegetation, the country is not an ideal one, but it is blessed with an ideal climate. In these dry elevated regions the heat is never oppressive, even when the thermometer reads 125 or 130 degrees, and the nights are always cool. The day readings of the thermometer are almost incredible, but there is no discomfort from such high temperatures for the reason that the very slight humidity of the air renders them hardly perceptible. The range between the day and night temperatures is often very great, but the houses of the Pueblo Indians have been conformed to these as well as other local conditions, and they are cool in hot weather and warm in cool weather.

The extent to which the physical peculiarities of the country have dominated the habits and customs of the people, their arts, and even their mythology, shows that this peculiar culture is a local product; that it was developed either in the region where it was found, or in one very similar to it. The whole system of mythology, while elaborate and complex, revolves around one central idea—the want of water. The Pueblo Indians are essentially farmers, and studies of ancient ruins show that in former times the products of the soil formed even a greater share of their means of subsistence than they do now.

Farming operations are always conducted on a very small scale —it is not agriculture but horticulture, gardening rather than field culture. Little nooks and sheltered corners in the mesas or small

patches in the valleys are cultivated to the highest degree, but by peculiar methods. In former times the staple was corn or maize, which to-day forms the main subsistence of these Indians, and in the northern and western part of the province where large areas of cultivable land were not available, the seed was usually planted in the sandy beds of intermittent streams, whose underflow served to keep the sand moist enough to mature the crop, for the seed was often planted a foot deep or more. In the large river valleys of the central and eastern part of the pueblo country irrigation is now extensively practiced, as it was in ancient times in the south, and the size of the crops is materially increased. But it is a mistake to suppose that irrigation was universally employed, or even that it was as much used in ancient times as now. Over the greater part of the region crops can be raised, and are raised to-day, without the artificial application of water, although with irrigation the chances of successfully growing a crop are much better than without it.

The custom of cultivating small patches here and there rather than large fields in one place was dictated by the character of the country and acted in turn on the houses and villages of the people. Over most of the region arable lands are found only in small areas, and the cultivation of these necessitated the partial breaking up of large communal villages. That is, while the large village remained the home of the people who had their houses there, they left it in the summer months to live in other places more convenient to their field of labor. These places were often 10 or 15 miles or even more from the home village, as in the summer villages of Ojo Caliente, Nutria, and Pescado, attached to the Pueblo of Zuñi.

As a rule, however, the summer settlements were not grouped into villages, for the little patches of cultivable land are usually few and far between, but consist of one or two rooms only. When the harvest is gathered these are abandoned for a time, the inhabitants retiring for the winter to the home village. From this custom it has resulted that practically all the religious ceremonies and dances take place at the home village in the fall and winter season and the early spring, when the people are congregated there. As a consequence the kivas, or sacred ceremonial chambers, in which many of the rites are prepared or take place, are found only in the home villages; and it is often possible to distinguish among the ruins the home pueblo from the subordinate summer settlements by the presence or absence of the kivas.

It seems odd at first sight and until we realize how completely the savage is a child of nature, that the whole life of a people should be

affected and dictated as it were by the minute topographic peculiarities of the country in which they live, but the effect of these peculiarities goes even farther, and it is to them that we must attribute the enormous number of ruins scattered over the southwest. The number of these remains has puzzled all students of the subject, and many writers have been driven to assume a large population; but that idea has now been pretty well abandoned.

The solution of the problem will be found in the peculiar custom just described; in other words, in the topographic peculiarities of the country. Many lines of evidence, tradition, arts, customs, mythology, and the ruins themselves, all concur in establishing the fact that the pueblo tribes were in slow but constant movement. Viewed across long periods of time it may be regarded as a migration, but it was not like the European migrations. The movement was extremely slow; a band might occupy one place for 20, 50, or even 100 years, and then locate at another, perhaps for an equal period, perhaps only for a year or two. The early students of the southwest were disposed to read in the ruins the evidence of an enormous population, and estimates of 150,000 or even 250,000 souls were not uncommon, but it is now fairly well established that the population of the pueblo country, now about 10,000, never exceeded 30,000 people, if indeed it reached that number. At first sight it seems unlikely that this comparatively small number of people could have left the thousands of ruins which dot the mesas and valleys of Arizona and New Mexico, but when we understand the peculiarities of the country and the sensitiveness of a primitive culture to such peculiarities the matter becomes clear.

The typical mesa is an elevated flat-topped eminence, sometimes standing alone, sometimes extending out from higher ground. The term mesa, which is from the Spanish and means table, is very descriptive and expressive. The edges of the mesas break down in cliffs or very sharp slopes, exposing the edges of the strata of which they are composed. The prevailing formations throughout this region are sandstones of light yellow and bright red; some of them are very soft, others are quite hard, while nearly all of them appear to be well stratified or laminated. The alternation of hard and soft strata in a cliff wall causes an alternation of vertical cliffs and steep slopes, which is the prevailing topographic type in this region. At the top we have a vertical cliff of 10, 20, or perhaps 100 feet; then a short slope of broken rock and débris, and another little cliff; and so on to the bottom. Through the action of frost and

storm sections are split off from the faces of the vertical cliffs and the débris is scattered over the slopes.

Hence it comes about that everywhere throughout the plateau province there is an immense amount of building material ready to hand and of the proper size. In fact most of it requires no dressing or other preparation, and the only labor necessary is the selection of the material and its transportation to the place where it is to be used. The lamination of the rock causes it to split up into thin slabs or tablets, in some cases almost as regular in size as manufactured brick. With the adobe soil found everywhere throughout the country an excellent mortar is made merely by the addition of water.

The use of outlying farming settlements prevailed throughout the entire pueblo country, and as suitable building material is abundant everywhere in that region thousands of such settlements were established. In fact, wherever there was an area of cultivable land adjacent or convenient to some large village a temporary settlement would be established. Often it came about that in the course of time the temporary settlement would be regarded as more convenient or more desirable in some way than the old home, some of the people would remain there all the year around, a kiva or two would be built for their ceremonial observances, and eventually the temporary settlement would become the permanent village. Soon it would put out other settlements, which might in the course of time supplant their parent. The process was a continuous one; it arose from the scanty distribution of small areas of cultivable land here and there, and it was made possible and easy of execution by the great abundance of suitable building material derived from the mesas, which might be regarded as great manufacturing plants continuously engaged in turning out broken stone of the proper size and shape for use by the pueblo builders.

Here then we have the conditions under which pueblo architecture developed: first, an abundance of suitable building material evenly distributed over a wide area, and second, peculiar topographic conditions which rendered easy if they did not compel the frequent use of the material. There was besides an element in the social life of the people which worked through these conditions and aided them as it were in bringing about the final result. This was the defensive motive, the pressure of surrounding wild tribes, which exerted an intermittent although on the whole constant influence.

Several attempts have been made to classify the ruins of the southwest, but in none of them has sufficient regard been had to

the character of the site occupied. The ancient pueblo builder, like his modern descendant, was so completely under the dominating influence of his geographic environment that from similar conditions he almost automatically worked out similar results. In the matter of a site for his home, however, he had some latitude, and the choice he made reflected something of the social conditions under which he lived. Thus it is probable that in the earliest times the people lived in small villages located on the edges of valleys or near the mouths of fertile flat-bottomed canyons. They lived a quiet, peaceful existence, depending principally on the soil for the means of subsistence, but not despising the harvest of grass seeds and wild nuts which were at hand, and glad to break the even, placid course of existence by periodical hunting expeditions to the neighboring mountains for deer and out into the great plains for buffalo.

In the course of time, however, other and more savage tribes came to the region, and these preyed upon the prior occupants of the country, who were industrious and provident and accumulated stores against possible bad seasons. It is doubtful whether there were any pitched battles or prolonged sieges, but the robbers made periodical forays through the fields when the crops were ready for the harvest, or perhaps assaulted and looted some small village when the men were away.

Under the influence of these conditions, which were annoying rather than dangerous, the little settlements in the valleys gradually drew together, and at a still later period villages of some size were established on the foothills of mesas and slightly elevated points overlooking the fields under cultivation, for horticulture was then as always the main reliance of the people and the fields must be under constant watch and supervision when the crops were maturing. It was probably at this stage in development that the use of outlying settlements, not unknown before, but not then well established, received its first principal impetus. For the clustering of the houses into large groups and the character of the country, which provided only small areas of good land here and there, were not in accord, and some means had to be devised to meet both conditions.

The first hostile tribes to make their influence felt were doubtless the Apaches or some tribe of that stock. Later the Comanches extended their range into this region, and the Utes came down on occasional expeditions from the north. The Pueblos were more and more subjected to the pressure of these hostile tribes, who found in the villages convenient storehouses of food, and were gradually compelled to select better and more defensible sites for their villages.

But still they attempted to preserve their individuality, and it was at this stage that many of the villages occupying points of high mesas or the summits of knolls or even of great rocks or boulders were built. Eventually, however, reliance upon the site occupied was found to be inadequate, and a number of related villages combined to form a single large one. Dependence was now had on the size and population of the pueblo, and it was located again in the open valley, in the midst of and overlooking the arable lands. Such are the modern pueblos of Zuñi and Taos, or the ancient villages on the Chaco now in ruins.

Examples of villages in the various stages sketched can be found to-day. At the time of the Spanish conquest in 1540 Zuñi did not exist as one pueblo, but there were five or six villages located on foothills or low elevations and as much as fifteen miles apart. At that time the Moki Indians also occupied a number of sites on the foothills of the mesas, while perhaps one village was on top. At a comparatively recent period the Mokis moved all their villages to the mesa summits. The Zuñis soon after 1680 occupied for a short time a high mesa site, but about two centuries ago they combined all the villages into one and located it in the open valley of the Zuñi River where they are now. Similarly some of the villages, like the pueblo of Acoma, which was unsuccessfully stormed by the Spaniards in 1540, occupied high and easily defended sites three or four centuries ago, while some of the villages of that period occupied open valley sites. As a whole, however, pueblo architecture appears to have developed in the manner sketched above, and the evidence suggests such a sequence in culture, although as yet we cannot establish any chronologic order.

Under long-continued peace the great valley pueblos break up again into small settlements, through the use of outlying farming shelters, which increase in number and importance as the home village grows larger. This process is now going on in Zuñi and in Moki. It appears to complete a cycle of development through which pueblo architecture moves, bringing it finally back to where it began. There is evidence in the ruins of at least one such cycle and a suggestion that there were two. There can never be another, for the conditions have been materially modified by contact with a superior civilization, and the savage has already lost that close touch with nature through which he responded so readily to natural conditions. In the western part of the pueblo country this change has been accomplished within less than two decades past.

The outlying farming shelters, or houses occupied temporarily,

are an invariable accompaniment of pueblo life wherever and in whatever stage of development we find it. They are a distinctive and characteristic product of the country. They occur in many forms, but in function they are always the same, and their remains constitute perhaps ninety per cent. of the ruins found in the southwest, while more than ninety per cent. of the remainder are indirectly due to the use of such structures; that is, to the slow migration alluded to, which operated through this custom of establishing outlying temporary homes. In the ancient province of Tusayan, now the home of the Moki Indians, farming shelters are mere brush structures obliterated by each winter's storms; in the old province of Cibola, the modern Zuñi, they usually consist of one or two rooms in some old ruin, which are maintained in good order, while the remainder of the ruin is allowed to sink to decay. About Zuñi, however, the location is a very favorable one; the village stands principally on the north bank of the Zuñi River, whose broad and open valley provides an abundance of excellent arable land; conditions which are duplicated on a lesser scale by its tributaries. Consequently, here the individual shelters of one or two rooms are not abundant, although they occur. They are replaced by aggregations of such shelters into small villages, occupied only during the farming season, but, except for such temporary occupancy and the absence of kivas, in all respects resembling the home village. There are three of such summer establishments connected with Zuñi to-day; there is one peopled from Oraibi, the largest of the Moki villages, although located nearly seventy-five miles distant from it; and, in fact, wherever the conditions were favorable—that is, wherever large areas of cultivable land were found—the tendency of the pueblo builders to put up their houses in clusters became in evidence. In other words, it was simply a matter of geographic environment; and the rules which governed the ancient settlements are working to-day on the same lines and with much the same effects.

This influence extended still further and even determined, unconsciously to the builders, the very form as well as the size and location of house clusters. All along the valley of the Verde River in southern Arizona the farming shelters took the form of small clusters or single rooms, constructed of selected river boulders, always more or less rounded as such boulders are. Even in that circumscribed region there are hundreds and hundreds of sites of such rooms, overlooking practically every foot of desirable land

along the river. But there are village ruins also, the home establishments, as it were, never constructed of boulders, but always of tabular stone, either sandstone or limestone.

The valley of the Verde is narrow and tortuous, hemmed in by mountain ranges on either side, and the cultivable lands are comprised wholly in little benches and terraces of alluvium in crooks and elbows of the river. These are small in extent and not overabundant, but at a few places along the river they broaden out into areas of considerable size, and in such places the number of ruins increases in proportion, and clusters of rooms or whole villages are found instead of single houses.

Yet where the topographic conditions are against this form of structure and favor others, others are constructed. In certain parts of the valley of the Verde there are extensive groups of cavate lodges—chambers excavated in the cliffs and generally without masonry additions or constructions of any kind. These are, however, unquestionable farming shelters or outlooks, located with reference to some area of good land which they command, and due to the occurrence in certain places of cliffs or hills of soft volcanic ash or tufa, in which a room or rooms could be excavated with more ease and less trouble than rooms of equal size could be constructed of masonry. The remains of similar rooms or cavate lodges are found in the San Francisco mountains, on the lower San Juan, and on the Rio Grande near Santa Clara; but in each case they occur in a similar formation—a compacted volcanic ash or very soft material which can be readily scraped off with a piece of soft wood. In other words, the occurrence and location of these cavate lodges are directly due to the accident of a certain formation, to a geological peculiarity of the country.

The cliff ruins and the cavate lodges are functional counterparts of each other, and the difference in form is due merely to difference in topographic environment. A systematic study of the cliff ruins of Canyon de Chelly conducted by the writer recently, an elaborately illustrated report on which is now in press and will probably be issued before the end of the present year, makes this very clear. A detailed study of the more than 150 ruins which compose the group shows that the home villages were generally located on the canyon bottom, on wholly unprotected sites, while the cliff ruins proper, which occupied to them much the same relation that the brush shelters of Moki do to the home villages of that province, were located in coves and on benches of the cliff with

reference principally to areas of cultivable lands which they commanded. If the defensive motive entered into the selection of the site, it occupied a subordinate place.

So that we have in the southwest an elaborate system of architecture, the highest attained by the aborigines in the limits of our country, springing directly from and influenced in its minute details by a peculiar topography. Only an outline is given here of the manner of evolution of this art in house building and of its dependence on the natural conditions under which it grew and developed, but the same pronounced influence is manifested in all the details of construction and finish. It was through the modification of the parts that the whole was affected and the final result attained.

COSMOS MINDELEFF.

GEOGRAPHICAL WORK IN CANADA, 1896.

BY

DR. G. M. DAWSON.

Progress made in geographical exploration of the less known parts of Canada during 1896 has resulted chiefly from the work carried out in three different and widely separated tracts, by Messrs. Tyrrell, Bell and Low, of the Geological Survey.

North of Lake Winnipeg, between Nelson and Churchill rivers, is an area of rather more than 25,000 square miles, chiefly drained by Grass and Burntwood rivers, which lies aside from the ordinary lines of travel, and consequently remained almost unknown. Mr. J. B. Tyrrell spent the past summer in this district, during which time he made surveys of the greater part of Grass River, with the lakes into which it expands; of the middle portion of Burntwood River, and of a number of other lakes and smaller streams, covering in all about 1,100 miles.

The existence at the head of Grass River of a large area of Huronian schists and conglomerates, broken by igneous intrusions and cut by many quartz veins, which may contain ores of the precious metals, was determined, and the extent of the area in three directions was roughly outlined.

Among the interesting results of the exploration is the discovery that the stratified alluvial or lacustrine clays that underlie the fertile valley of Red River extend north of Lake Winnipeg and west of Nelson River, in a belt from fifty to seventy miles wide, at least as far north as North Latitude 56°.

In the basin of the Nottaway River, lying between the sources of the Ottawa and James Bay, Dr. R. Bell continued his exploratory work of 1895. This stream, fed by numerous large branches, is described as discharging to the north a great volume of water. Not only is its drainage area very considerable, but the rainfall of the region is exceptionally heavy. The surveys of the past year were directed to the tributary streams and to a route known to the Hudson's Bay Company, running northward from Waswanipi Lake to the Rupert River, and crossing the valley of the Little Nottaway or Broad-back River, which flows into James Bay, between the Nottaway and the Rupert. Mr. R. W. Brock, who assisted Dr. Bell, independently explored the upper part of the Mekiskan Branch and

Waswanipi River, and by the last-named stream eventually reached Mistassini Lake to the eastward. Much of the Nottaway basin possesses a good soil, which may one day be utilized for agricultural purposes, and the definition of a wide and long belt of rocks of the Huronian system leads to the belief that important discoveries of metalliferous deposits like those of Sudbury, Lake of the Woods and Rainy Lake are possible.

Mr. A. P. Low, during the summer of 1896, was engaged in an exploration of a route across the northern portion of the Labrador Peninsula, extending from Richmond Gulf, on the east coast of Hudson Bay, to the mouth of the Koksoak River, on Ungava Bay. In order to reach the starting point of the exploration he descended to Moose Factory from the Canadian Pacific Railway by the Missinaibie Branch of the Moose River. From Moose Factory the foot of James Bay was crossed and the east coast was followed northward about 500 miles, a large open boat being used for this part of the journey. The boat was left at Richmond Gulf and the party passed inland in two wooden canoes. The route followed soon rose to the level of the table-land, about 800 feet above sea-level, and passed eastward 75 miles, through small lakes and rivers, surrounded by low semi-barren hills, to Clearwater Lake. This lake was explored and found to be about 45 miles long and 25 miles across in the widest part, and is dotted with numerous islands. From Clearwater Lake a short portage-route was followed to Seal Lake, which was found to be more than 50 miles long and from one to five miles wide. Seal Lake is but a short distance from the water-shed between the rivers flowing into Hudson Bay and those of Ungava Bay. Having crossed the height-of-land at an elevation of about 900 feet, the Stillwater Branch of the Koksoak River was descended 275 miles to its mouth. For the first six miles the river is small and almost a continuous rapid, after which it is easily navigable with canoes. From Fort Chimo at its mouth the H. B. Co.'s ship was taken to Rigolet, whence the party reached Quebec in a schooner. Among the results of the exploration may be mentioned the micrometer survey of the route followed, and a knowledge of the character of the surrounding country, which throughout is a rolling plateau broken by rocky ridges, with stunted trees confined to the valleys, the higher parts being without wood.

Work has also been continued by the Geological Survey during the year, upon the areas covered by a number of sheets of the Geological map, chiefly in Nova Scotia, Ontario and British Columbia.

Mr. W. Ogilvie, of the Topographical Surveys Branch, Depart-

ment of Interior, spent the winter of 1895–96, as well as the past summer, in the Yukon District of the North-West Territory. As he has not yet returned, no details of his work are available, but much of his time was given to a preliminary delineation of the line of the 141st meridian, constituting the treaty boundary between Alaska and that part of Canada. The definition of this north-and-south line is important, because of the developments in alluvial gold mining going on in its vicinity; but any surveys made of it without the co-operation of the United States are, of course, not authoritative or final. The definition of the line here is, however, purely an astronomical and geodetic question, about which no difficulty whatever can arise when concurrent work is entered upon by the two interested Governments.

Surveys for the purpose of ascertaining the conditions in respect to irrigation have been continued in Western Alberta, on the same plan and on about an equal scale to those of the year 1895, for which a detailed report with numerous maps is already available.

The Survey of Tides and Currents in Canadian waters, under the Department of Marine and Fisheries, has been continued by Mr. W. Bell Dawson. Seven principal tide-gauges are now established on the Atlantic coast. Tide tables have been issued for Halifax and Quebec, and observations for the extension of tidal differences to other points are in progress. Surveys of Currents have been directed to the Gulf of St. Lawrence and its approaches.

THE PHYSICAL GEOGRAPHY OF NEW YORK STATE.

PART II.*

BY

RALPH S. TARR.

THE MOUNTAINS OF THE STATE.

Use of the Term Mountain.—There are few geographical terms used more confusedly than that of mountain. In common usage is meant any unusual elevation rising above the surface of the surrounding country. Hence in Texas, a hill reaching an elevation of one or two hundred feet above the monotonous plain is called a mountain, while in New England, elevations of even one or two thousand feet are called hills.

In reality more than one geographic feature is comprised in the single term. If we look at the typical mountains of the world, we find the main fundamental features to be folds in the rocks. A part of the crust has been bent or broken, with the result of an unusual elevation. Such mountains occur in ranges, the axes of the folds being longer than the cross section. However, the mountain folds of the land are no sooner begun than they are modified by denudation. The various forms of rock texture are etched, so that very soon the fold is no longer the prominent feature, but instead, peaks or ridges, which have been brought out into relief. In the course of time denudation may so plane down the mountains, that like the eastern part of the States of Pennsylvania and New York, although the rock structure is that of the mountain, the topography is that of a series of low hills, or in some cases even of a plain.

In a structural sense, and hence in geographic usage, these planed-down mountain ranges must be called mountains still, although they no longer possess the features which we commonly associate with these geographic forms. In their origin, the topographic mountains are elevated structures of folded or faulted strata, but they are greatly modified by denudation. They are carved into peaks and ridges which are made of harder rocks, and these may either be horizontal or tilted sedimentary strata, or even perfectly massive igneous rocks.

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* Continued from Vol. XXVIII, No. 2, 1896, p. 129.

In the peaks the fundamentally important feature is no longer folding, but rock texture as carved by denudation. So the peak and mountain range are not the same, either in origin or structure. The peak is really a hill, and it may be of great or slight elevation. There can be no real line of distinction drawn between the low Pilot Knob of Missouri, which rises to only a slight elevation above the plain, and the great Pike's Peak; both are elevated peaks of igneous rock. Nor is there any essential difference between the low, flat-topped hills of the plains and plateaus, rising above the general level because of the hard upper strata, and the peak carved out of the equally horizontal and variable rock strata, existing in the centre of the syncline or anticline. So I hold, that in geographic nomenclature we must distinguish between the *mountain peak*, an erosional form, and the *mountain range*, a structural type, modified more or less extensively by denudation, and perhaps even cut into peaks, though more commonly into ridges. The mountain range corresponds more closely with the *geographic* use of the term mountain, while the peak is more in harmony with the *common* usage. A geographic mountain need not have an unusual elevation, but *must* have complexity of rock structure; the peak, on the other hand, *must* have elevation, but not of necessity complex internal structure.

Where exactly to draw the line between the geographic mountain and the plateau, and where between the hill and the peak, is difficult to define. Concerning the latter, however, there is little real difficulty, for the peak and hill are of the same geographic type; but the mountain and plateau are quite different topographic forms. We are constantly confronted by the difficulty of deciding which is the true mountain, and which so-called mountain is only an elevated and dissected plateau. In fact, the Catskill Mountains of New York furnish a typical example of this difficulty. These are not true mountains in the geographic sense, but are dissected plateaus simulating mountains; they belong to the type which brings confusion to the geographic nomenclature, for nearly every one recognizes them as mountains. They are more than mere peaks, being in reality a group of peaks. The Catskill type of greatly carved horizontal rocks may be called *pseudo-mountains.*

Mountain Groups in New York.—There are five mountainous areas in the State of New York. These are the Adirondacks, the Taconic series, extending from Vermont across New York into New Jersey, the Kittatinny Mountains, entering the State from

New Jersey, the Palisade range, also entering from New Jersey, and the Catskill Mountains. Of these, three are merely minor portions of mountain masses belonging really to other States. The Adirondacks and Catskills reach the greatest elevation, and from that standpoint are the most representative mountains in New York; and they also are entirely included within its boundaries. Since the Catskills consist of nearly horizontal strata, while the

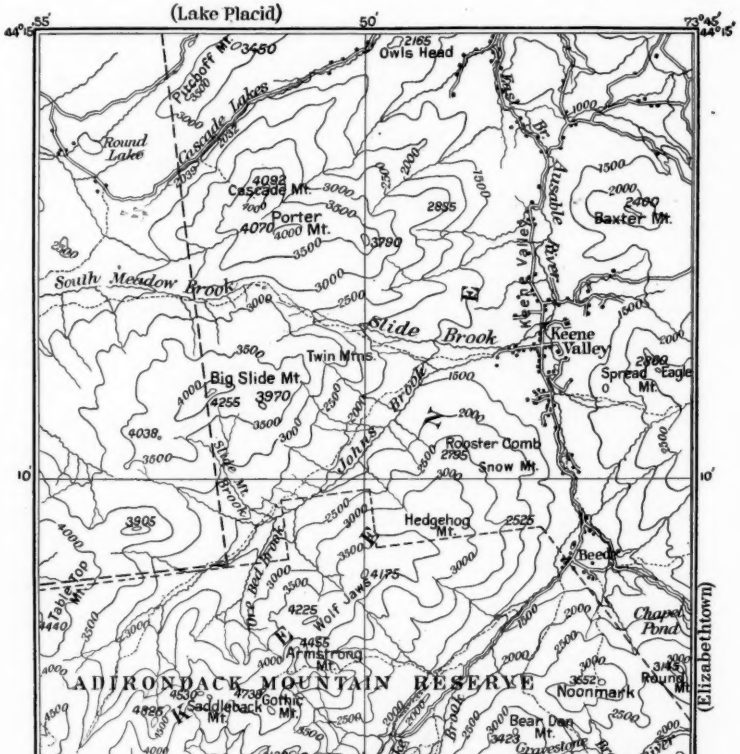

FIG. 1.—MAP OF A PART OF THE ADIRONDACKS, CONTOURS EVERY 500 FEET (BASED ON U. S. GEOL. SURVEY TOPOGRAPHIC MAP).

other systems are made of rocks usually complexly folded, the Catskills are really the least representative mountains in the State; in fact, as has been said before, they are not properly mountains, but imitation mountains.

*The Adirondacks.**—These mountains furnish one of the most typical illustrations of a class; they are true mountains in form and structure, long subjected to denudation, and reduced to a fraction of their former elevation. Their life history has been long and complex. Commencing at some period of Archean time, long before the beginning of the geological record, which properly commences with the Paleozoic, they have maintained a land condition almost, if not quite continuously down to the present time. Their origin and history have been similar to that of the New England and Canadian mountainous provinces.

First elevated during that earliest geological period, the Archean, the Adirondacks rose as an insular land area in the earliest Paleozoic sea. Then, as now, they were a land of complex structure, composed of hard and durable norites, gabbros, and gneisses. Among these were beds of iron and other minerals and rocks characteristic of the crystalline series. These rose into the air and decayed as rocks do now. Then, as now, rivers flowed down the mountain sides and entered the Paleozoic sea, part of which occupied the site of the present State of New York, and into this sea the rivers carried sediment derived from the mountains. This the waves and currents worked over, building the rocks that now underlie the soil of the State.

This history of mountain destruction and sediment accumulation is told us by the beds of Paleozoic strata which encircle the mountains. There are Cambrian beaches built by the waves of this ancient period, and in these the pebbles are of the same rock that now constitutes the Adirondacks. Hence when these beaches were accumulated, the kind of rock that made the land was the same as at present. In some places beneath these beaches has been found a soil that was formed before the beach gravels were accumu-

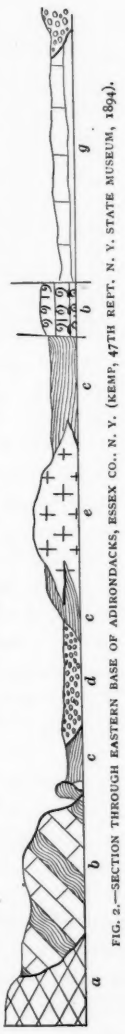

FIG. 2.—SECTION THROUGH EASTERN BASE OF ADIRONDACKS, ESSEX CO., N. Y. (KEMP, 47TH REPT. N. Y. STATE MUSEUM, 1894).

* See references, Bull. Am. Geog. Soc. XXVIII, 1896, 109.

lated, and hence representing disintegration of the rocks at some period before the Cambrian sea encroached upon the land. The surrounding rocks tell us of another stage in the development of this ancient mountainous area. The Cambrian and Lower Silurian (or Ordovician) strata which surround the mountains are folded and sometimes metamorphosed into schists and other kinds of metamorphic rock. Hence, after these were deposited in the Paleozoic sea, in a nearly horizontal position, they were uplifted and folded, and with them of course the Adirondacks of which in some places they now constitute a part (see Fig. 2).

There is negative evidence, and hence evidence of less value, that this was the last time during which the Adirondacks were extensively folded. South of the mountains stretches an extensive area of Silurian and Devonian strata, in a nearly horizontal position. Therefore, since the beginning of the Silurian these rocks have not been folded, and since this is true, it seems probable that the neighboring Adirondacks have likewise been free from extensive post-Ordovician folding. On the other hand, however, there is evidence that, though no folding has taken place, they have been subjected to uplift; for the beds that were accumulated beneath the surface of the Paleozoic ocean are now raised well above the sea-level. Such an uplift, so near them, must also have caused an additional elevation of the Adirondack Mountains, although, as has been said, there is no evidence that this elevation was accompanied by folding.

While these changes of elevation have been in progress, there have doubtless also been times when the level of the land has been lowered. In fact this must have been so, for the thickness of the strata between Lower Cambrian and Upper Devonian, in the region south of the Adirondacks, is several thousand feet. These beds, one deposited upon another, were accumulated in a shallow sea. The evidence of this is, that the strata are varied in texture from pebbles to clay, and are mainly made of fragments of rock that have been derived from the land. Such coarse materials could not have been carried far from shore. Moreover, the presence of ripple marks in many of the beds proves shallowness, and beaches that occur among these ancient sediments point to the same conclusion. To form such a thickness of rock in a shallow sea, the bed of the ocean must have been sinking, and if this were true of the sea bottom, a part, if not all, of the Adirondacks must also have been settling. In later times, when the Tertiary sea entered the Lake Champlain valley, there was another period of depression.*

* Marine beaches north of the Adirondacks furnish evidence of lowering and elevation just preceding the present era.

During these elevations, foldings and depressions, the Adirondack land mass has been subjected to denudation, for it has stood above the sea-level throughout the greater part of the time that has elapsed since the Archean. Naturally, in so vast a period of time the mountains have been deeply breached, and had it not been for new elevations, we may be certain that, by this time, the area would have been levelled to the condition of a plain, standing near the level of the sea. It is impossible to say how much has been removed from the Adirondacks by this action, but certainly many thousands of feet of strata have been cut off and carried away. Could we know in detail what the Archean history of the mountains has been, we might be able to state how much elevation they have lost by denudation; but while figures cannot be assigned, there is on every hand evidence of immense loss by denudation.

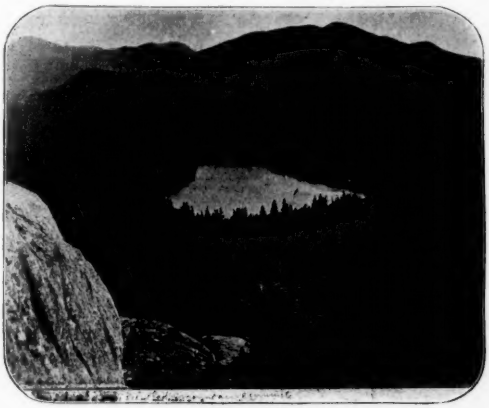

FIG. 3.—THE ROUNDED, MATURE PEAKS OF THE ADIRONDACKS (PHOTOGRAPH COPYRIGHTED, 1888, BY S. R. STODDARD, GLEN'S FALLS, N. Y.).

Examining the surface features of the Adirondacks, we find them to be mountains of considerable elevation, somewhat rugged in outline. Still, when we compare them with the Andes, Alps, or Rockies, we find them to be much less elevated and rugged. There are no lofty, inaccessible cliffs, but instead, rounded, easily scaled hills, and mountain peaks, reaching only very rarely to a height greater than one mile above sea-level. Roads may be constructed upon most of the mountain sides, and railways enter the very heart of the system of peaks, while paths are present nearly everywhere, so that practically no portion is inaccessible. This is very distinctly in contrast with the conditions of the Alps, many portions of which are reached only by the most arduous climbing, while some parts are practically inaccessible.

The Alps are *young mountains*, and denudation has progressed

only far enough to sculpture into very rugged relief the strata of varying hardness. In the Alps the granite masses rise into a Jungfrau or Matterhorn (Fig. 4), peaks of marvellous ruggedness; but in the Adirondacks the long-continued action of denudation has carried the development of the topography from this youthful stage to that of *maturity* or early old age. Here the granitic crystallines stand above the general level as a Mt. Marcy, while the softer beds are the sites of valleys. But these granite peaks have a gentler and more flowing outline (Fig. 3), because denudation has passed the stage of greatest activity. The height of the mountains has been so reduced, that the action of flowing water cannot be compared with the intensity that is possible in more lofty ranges, like those of the Alps.

FIG. 4.—THE MATTERHORN, SWITZERLAND, A YOUNG MOUNTAIN PEAK.

This rounded form of the Adirondacks has, perhaps, been increased somewhat by the scouring action of the ice of the Glacial period, which overrode the highest peaks of these mountains. Too little study has been given to this region for us to state much about the action of the ice there. Some material was, no doubt, taken from the mountain sides and valley bottoms, and some was deposited; and as a result of this modification, the surface was left a little smoother than before the ice came. But we may be certain that this was in the manner of finishing touches, not of primary carving and sculpturing.

In New England, New Jersey, and elsewhere in the East, there is evidence (see p. 30) that denudation succeeded in reducing the mountainous land to even less rugged outline than is now present, and many believe that this reduction amounted even to planation, so that the surface became nearly level, or was reduced to the

peneplain. The evidence of this reduction to such moderate outline that mountains lost their truly mountainous form, is very strong indeed, and the levelling seems to have been widespread. This being so, it must have reached the neighboring Adirondacks. So the Adirondacks are mountains of a new cycle, and after a complex history, some of which has been stated, they were nearly levelled, or at least reduced to less relief than now. This was in the Tertiary period. Then they, together with the surrounding country, were uplifted again, and once more brought under the influence of mountain denudation. At present they are well along in development in this new cycle, having again reached the outline of maturity. Perhaps such changes have been passed through again and again during the history of these mountains.

The Adirondacks have been contrasted with the Alps; they may also be brought into contrast with the Appalachians. These likewise are not strictly comparable with the Alps or Rockies, but they have some of the features of the Adirondacks. It is not difficult to ascend to the top of practically all the ridges of the Appalachians; but if we examine these two sets of rounded and easily traversed mountains, we see some fundamental differences. The Appalachians are made up typically of *ridges* (page 31), while the Adirondacks are typically isolated peaks or groups of peaks. These differences are directly traceable to the rock structure. Denudation is a delicate tool in the sculpturing of the earth, and in the course of its work it detects differences in rock hardness with wonderful precision. The soft or weak layers have suffered greatly, while the hard or durable rocks have better withstood the action of the tools. Consequently hard strata are etched out in relief, soft ones cut more deeply.

The Appalachian rocks are sheets of sediment, variable in hardness and folded into waves, as we might fold the pages of this book. Hence, in etching such layers, denudation carves ridges. This can be understood by bending a series of sheets of cardboard, then cutting them horizontally and imagining some to be softer than others. The soft layers, attacked by denudation, are lower in position than the harder ones, and these differences in texture are expressed in ridges and valleys. The hard strata of the Appalachians have resisted denudation and are now elevated. Their sharp edges extend for great distances with relatively narrow width, and the resulting typical form is therefore the ridge (Figs. 5, 6, 7, 12 and 14).

Among the Adirondacks, on the other hand, the rocks have no such sedimentary structure, but are masses of crystalline rock,

intimately and complexly associated. Hence the harder portions that are etched into relief have no such linear arrangement, but are in the form of peaks or groups of hills (Figs. 1 and 3). The Appa-

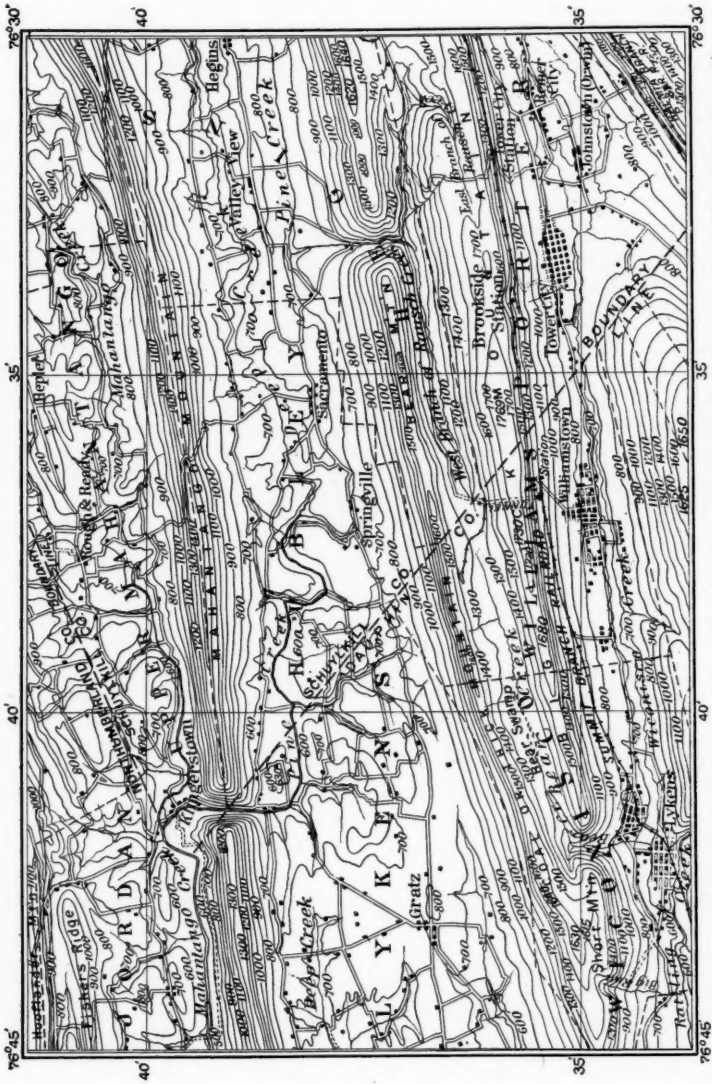

FIG. 5.—MAP OF A PART OF APPALACHIAN MOUNTAINS, PENN. CONTOURS EVERY 100 FEET (BASED ON U. S. GEOL. SURVEY TOPOGRAPHIC MAP).

lachian type of mountain might be called the *sedimentary type*, the Adirondacks the *crystalline type*.* We will speak of those mountains having the ridge form as the *Appalachian type*, because so typically

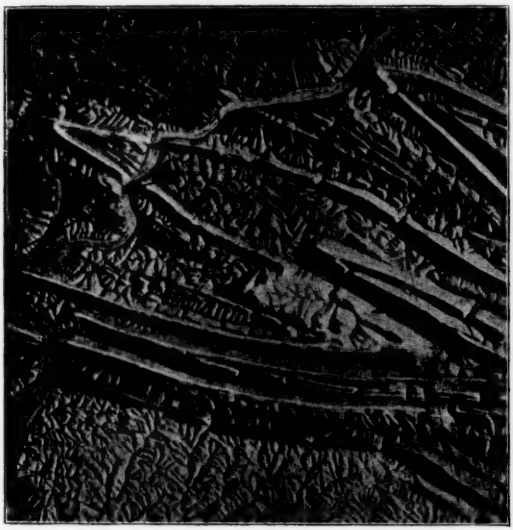

FIG. 6.—THE APPALACHIAN RIDGES (A PART OF HARDEN'S MODEL OF THE ANTHRACITE COAL REGION, PENN.).

represented in these mountains; and the crystalline type of peaks may be called the *Adirondack type*.

Having *contrasted* the Adirondacks with other well-known systems of mountains, it remains to compare them with their analogues. Their type structure is that of crystalline mountains of rounded, mature form, with peaks caused by the etching out of harder areas of crystalline rocks. The White Mountains of New Hampshire are of the same type exactly; so also are many of the mountains of the Labrador peninsula, and the Canadian Highlands; and the same type is found in the Scottish Highlands and the Scandinavian peninsula. In New England there are many other than the White Mountains which belong to the Adirondack type. Mount Katahdin,

* Some mountains of crystalline rocks, such as those of New England, have the linear or ridge form of typical topography, and some massive sedimentary rocks have been carved into peaks resembling the crystalline type.

in Maine, the Blue Hills near Boston, and many other peaks and groups of peaks in this part of the country are of this type.

FIG. 7.—A MOUNTAIN RIDGE OF APPALACHIAN TYPE IN COLORADO (U. S. GEOL. SURVEY PHOTOGRAPH).

But we cannot properly compare the Adirondacks with *all* the New England mountains, for in many parts of these States, as well as in New Jersey, eastern Pennsylvania, and the more southern States of the coast, east of the Appalachian ranges, there are mountains of mature form, composed of crystalline rocks, which differ from the Adirondacks, first in being generally less elevated and less diversified, and secondly in frequently assuming the form of ridges. These ridges are less distinct than those in the Appalachians, which are made of sedimentary strata, and they are often so dissected that they approach the Adirondack type. In reality they belong to an intermediate group of mountain form, in which the characteristic feature is that of elongated peaks or shortened ridges (Figs. 8 and 10). The mountains of this type may be called the *Berkshire type*, because they are well illustrated in the mountains which were formed during the growth of the Taconic and other ranges in eastern New York and western New England. They are most perfectly illustrated in the Berkshire Hills; hence the proposed name.

*The Taconic Mountains.** — Before the dawn of the Paleozoic time mountains existed in New England and New Jersey, as well

* See references, Bull. Am. Geog. Soc. XXVIII, 1896, 102, 103, 104.

as in the States south of here. The sea which bathed the Adirondacks also beat against the foot of these more eastern mountains. This shore line passed somewhere near the New York State border.

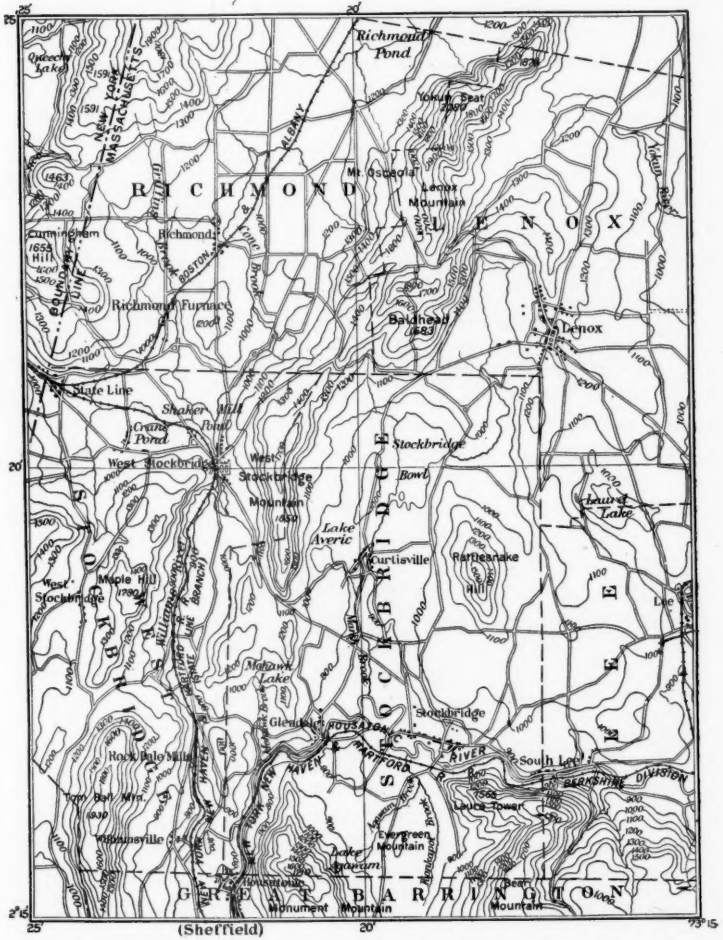

FIG. 8.—MAP OF PART OF BERKSHIRE HILLS, WESTERN MASSACHUSETTS. CONTOURS EVERY 100 FEET (BASED ON U. S. GEOL. SURVEY TOPOGRAPHIC MAP).

Remains of these mountains are still left in various parts of New England, where they form mountains of true Adirondack type. By their long-continued denudation, sedimentary deposits were fur-

nished to the interior sea, and during the Cambrian and Lower Silurian periods the waste of this mountainous land, and of the Adirondacks, was strewn over the sea bottom, partly within the boundaries of the State of New York. Similar mountains also occupied the site of the greater part of New Jersey, and the old Archean land probably extended to the eastward of the present shore.

The close of the Lower Silurian was marked by a regrowth of these eastern mountains; but the new rock-folding involved a part of the old sea bed, and as has been stated, at the same time caused a new development of mighty mountain ranges in western New England (and probably also in the eastern part of these States) and eastern New York. Folds of great complexity (Fig. 9), and faults of marked extent, raised the ocean sediment into lofty mountains, while denudation in time breached these into rugged peaks and ridges. Accompanying this, in many parts of the East, volcanic energy broke forth, and great sheets of lava flowed out over the surface, while beds of volcanic ash were strewn over land and sea.

As in the case of the Adirondacks, the later history of these mountains has been mainly one of destruction in the air. There has been later folding and elevation, as well as depression; but the great post-Ordovician work has been reduction of the mountain height; denudation has breached the ridges so that now their very roots are revealed, and their internal anatomy exposed to view.

By the study of the basal parts of these mountains, it is seen that the mountain growth was more extensive in the northern than in the southern part of New England, and that it also increased in intensity from west to east. This is proved by the fact that the rocks of the Green Mountains of Vermont have been much more metamorphosed than those in the same line of folding in New Jersey, and that the strata in the Berkshires of Massachusetts have been more highly altered than those of the Taconic Mountains just west of the Berkshires. In some places this metamorphism has proceeded so far that gneisses have been made out of conglomerates and other sedimentary beds; and nearly everywhere in the New York-New England area the sedimentary strata have been transformed to schists, or the sandstone to quartzite, the limestone to marble and the shales to slates.

Denudation has etched these complexly altered and folded strata, and since they were originally deposited as *sheets* of sediment, though now greatly changed, the folding has placed them in such a position that, like the Appalachians, they have been carved into ridges. But the *complexity* of the rock structure and position

is greater than in the Appalachians, and hence the ridges are not long and continuous, but short and choppy, with many intermediate peaks (Figs. 8 and 10). This is the typical Berkshire type. There

FIG. 9.—CROSS SECTION OF PART OF BERKSHIRE HILLS IN WESTERN MASSACHUSETTS (PUMPELLY, ETC., MONOGRAPH XXIII, U. S. GEOL. SURVEY).

is a mixture of the sedimentary and crystalline habit; hence, in general, the mountains extend in ridges that run parallel to the lines of folding (generally about north and south in New England and New Jersey); but we cannot follow the ridges for any considerable distance. The difference between Appalachian and Berkshire types of mountains is quite like the difference between the well-developed ocean swell and the deep, wind-broken waves of the billowy sea.

The Taconic series includes mountains of varying height, some nearly as lofty and rugged as the Adirondacks. These are well illustrated in the Hoosac Mountains of western Massachusetts and the Green Mountains of Vermont. In other parts the ridges are low hills, like those in the southern part of Connecticut and in the neighborhood of New York City. These latter, though in the form of low, well-rounded hills, are as typical mountains, in a geographic sense, as are the peaks and ridges of the Green Mountains. The difference is merely that, in the vicissitudes of destruction, the former have been lowered nearly to a lowland condition. They are mountains reduced in elevation nearly to sea-level. If the rocks that once covered the site of the City of New York could be restored, they would rise into peaks rivalling the highest mountains of the world.

FIG. 10.—A SHORT RIDGE SHOWING BERKSHIRE TYPE, WESTERN MASSACHUSETTS.

Standing upon the crests of the hills in the Highland Mountains

of New Jersey, or the hilly land of Connecticut or central Massachusetts, we see that the peaks and ridges rise to a moderately uniform elevation (Fig. 11). Descending into the valleys, the mount-

FIG. 11.—THE ANCIENT MOUNTAINS OF NEW ENGLAND, SHOWING PENEPLAIN SURFACE.

ains are seen to rise hundreds, and in some cases a thousand or more feet above the valley bottoms. The appearance made by the regular crests, viewed from the hill tops, is that of an undulating plateau, while from the valley bottom one appears to be in a mountainous region of geographically mature form. This evenness of elevation is all the more remarkable because of the irregularity of the rock structure and position; it looks as if the crests were merely remnants of a former lowland, now elevated and dissected. This supposed lowland has been called a *peneplain*,* and the most forceful proof of this former nearly level condition is found in the fact that in a country of moderate ruggedness, and of complex rock structure, the peaks should rise to a nearly uniform level.

If the evidence of the level crests is to be believed, then the mountains of the East were once reduced to the much lower and more uniform condition of old age, or certainly of great maturity. The surface of all the land south of New England and New York was then a lowland. Elevation then lifted the bevelled mountains and permitted denudation to begin upon a new cycle of work. It has now produced the present low, rounded form, indicating maturity of development in a new cycle. Upon this explanation of the mountain features, it is necessary to suppose that the ancient

* Davis, Am. Journ. Sci., 1889, Ser. III, XXXVII, 430; Proc. Bost. Soc. Nat. Hist., 1889, XXIV, 373; Nat. Geog. Mag., 1895, II, 81; National Geographic Monographs, I, 269; Bull. Geol. Soc. Am., 1896, VII, 377.

peneplain has been lifted higher in northern and western New England than nearer the sea coast. Hence in the more northern region the high mountains are now carved into more rugged appearance.*

Other mountainous areas which are believed to have once reached the old age condition of the peneplain, and have later been lifted, are described from various parts of the earth. The most typical cases in the United States are those of New England, particularly of Connecticut and eastern and central Massachusetts. The same feature is seen in New Jersey and the crystalline region east of the Appalachians, as far south as Alabama. In Europe, cases are reported from the valley of the Rhine, the Scandinavian peninsula, and the Highlands of Scotland. From the numerous instances, it would seem that in the Tertiary period there was a widespread levelling of the land, which indicates that in places there was a general freedom from extensive elevation. Also it would seem that this period of land quiet and land lowering was succeeded by a time of general uplift and deep dissection.

The Berkshire type of mountain, especially well illustrated in western Massachusetts and eastern New York, is also found all the way along the eastern base of the Appalachians, as far as Alabama. Undoubtedly its counterpart will be found in portions of all the great areas of low mountains composed of crystalline rock in various parts of the earth. The type may be looked for in New England, Labrador, Greenland, Scandinavia and Scotland; and in many places it may grade into, or be intimately associated with, the Adirondack type of mountain structure.

The Kittatinny Mountains.†—The folds of the Appalachians involved a small part of southeastern New York. The great plateau of the State was raised and the rocks composing it slightly folded; but in one part, in Orange, Sullivan and Ulster counties, ridges of distinct kind enter the State from New Jersey. These, given various names, are the continuation of the Kittatinny range of New Jersey.

* It should be stated that I am not convinced of the full truth of this explanation, but believe that it should be modified. My reasons for this will shortly appear in an article in the *American Geologist;* but since the peneplain explanation has been so fully stated, so ably supported by numerous facts, and is widely accepted, and since it is impossible in this place to present my arguments in detail, I have felt called upon to present as plainly as possible the generally accepted explanation.

† See Mather, Geology of New York, 1st District, 1843, pp. 355–7; Darton, Nat. Geog. Mag., VI, 1894, 23–34; New York State Museum Report 47, 1894, 485–566.

After the Taconic Mountains and the ranges of New England were elevated, near the close of the Ordovician time, the sea occupied the greater part of New York State, and continued to do so until the beginning or middle of the Carboniferous period. The Taconic Mountains, and those of the New Jersey Highlands, formed the eastern boundary of this sea, and at that time the site of the Appalachians was sea-bottom near this shore line. Then came an uplift, involving the New England region, and extending at least as far south as Alabama. Sedimentary strata were folded into ridges, sometimes with rock folds and faults of great complexity, but generally in simple or slightly overturned anticlines and synclines. In the greater part of the area outside of New England, the folding was not sufficiently intense to greatly metamorphose the strata, and hence they still exist as sedimentary layers of conglomerate, sandstone, shale, limestone, etc. (Figs. 12, 13, 18 and 19).

FIG. 12.

These Appalachian foldings probably affected the entire southeastern part of the State of New York; but the influence upon the ancient mountains, which were uplifted in Ordovician times, is so masked that it is difficult to detect. In Pennsylvania the ridges are typically developed (Figs. 5 and 6), and some of these enter New Jersey and cross the State into New York. Of these the most notable are the Kittatinny Mountains, which, at the New Jersey-Pennsylvania line, are traversed by the Delaware River, where it passes through its famous "Gap." Folded rocks here stand tilted at a high angle and extending along the strike in a northeast direction. These mountain ridges are capped by a hard layer of conglomerate, and rise to a wonderfully uniform level.

This range grades westward into less and less folded strata, and

finally the folds give place to nearly undisturbed horizontal rocks (Fig. 17), just as they do in Pennsylvania west of the Appalachian chain. In New York the folds also die out in the northern portion. Hence, pronounced in New Jersey, the ridges become less notable in New York, and finally practically disappear in Ulster County. Here they merge into and give place to an escarpment of Helderberg limestone, forming the so-called Helderberg Mountains of Albany County.

These foldings tilted the horizontal rocks and elevated them into mountains; denudation sculptured and lowered them, and it is believed even reduced the mountains to a lowland of moderate level, like the peneplain of New England. When, in late Tertiary times, New England and the neighboring regions were elevated, the Appalachians were again raised, not perhaps by folding, but by a slow uplift, which, giving new life to the streams, and new power to the agencies of the weather, permitted the sculpturing of the rocks anew. The softer layers were removed and the harder ones left standing in relatively prominent position. Since they were tilted layers or sheets, this sculpturing commonly caused ridges where harder strata occurred, and valleys where softer beds existed between them. This is the characteristic Appalachian type of mountains, and it is seen in the Kittatinny Mountains of New Jersey and the Shawangunk Mountains of New York (Fig. 12). Sometimes the durable rock at the crest of the ridge is conglomerate, at other times sandstone, and still again, as in the Shawangunk, a limestone of dense and resistant nature. Upon these ridges one may travel for miles at a nearly uniform level.

So the mountain ridges of the Appalachian type in New York, represent mountains of mature form, without great relief and with moderate, easily scaled slopes, quite in contrast with Alpine or Andean ruggedness. They have passed the stage of rugged youth, but their maturity of form is that of a new cycle. Formerly they were more reduced, and now have been advanced as far as maturity in a new life history, made possible by elevation.

This stage of mature development is found in many of

FIG. 13.—A SECTION SHOWING APPALACHIAN FOLDS AND ETCHED MOUNTAIN RIDGES (U. S. GEOL. SURVEY, RINGGOLD; FOLIO 4, HAYES).

the mountains of the world. (See page 31.) It is especially well shown in the entire Appalachian chain. The type of mountain form called the Appalachian, whose characteristic feature is the ridge of sedimentary rock, made into a ridge because of the resistant nature of some of the beds, is seen all through the Appalachians (Figs. 5 and 6). The ridges are etched into moderate relief by denudation, and the slope is steeper on the side away from the direction of dip of the strata than in the direction from which the rocks dip (Fig. 14). In the Sierra, the Coast Ranges, Basin Ranges, and Rocky Mountains of the West (Figs. 7 and 14) it is a common type, as it is in the Andes, the Himalayas, the Alps, Jura and a multitude of other mountains of the world. There is much difference, however, in the details of form. The typical Appalachians are mature in geographic age. But among many of the younger mountains mentioned above (the Andes, etc.), the time for the action of denudation has not been sufficient to carry the topographic outline far enough for the typical development of the type features. In origin and rock structure they are the same as the Appalachians; but they are not sufficiently mature for the full development of all their latent possibilities. Given time, they will become so, for they are of the same geographic family.

FIG. 14.—A MOUNTAIN RIDGE ON CANADIAN PACIFIC (NOTMAN, PHOTOGRAPHER).

*The Palisade Ranges.**—When a much more durable rock occurs among softer ones, in the course of denudation it will remain well above the general level of the others. It is upon this principle that the ruggedness and many of the characteristic features of mountains depend. In New Jersey there is a series of such dense beds of

* See references, Bull. Am. Geog. Soc., XXVIII, 1896, 103.

unusual kind, and one of these enters the State of New York along the western bank of the Hudson, from Upper Bay to Haverstraw. These are beds of trap rock, a black, dense diabase, which is decidedly more durable than the enclosing sandstone strata. In New York the diabase forms the Palisades, in New Jersey several ranges of hills or low mountains, notably those along the Hudson, near Hoboken, and also those near Paterson, Orange and other parts of northeastern New Jersey.

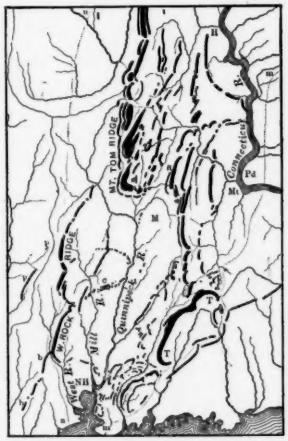

FIG. 15.—TRAP RIDGES (BLACK) IN CONNECTICUT VALLEY. (DANA'S TEXT BOOK OF GEOLOGY, AFTER J. G. PERCIVAL.)

During the Triassic period, eastern New Jersey was beneath the sea. An arm of the ocean also extended up the Connecticut, at least as far as the Vermont boundary; and at the same time various other parts of the Eastern States were submerged. Beds of sandstone and shale were deposited in nearly horizontal position in these ocean bays. At the same time, in the Connecticut valley, and perhaps also in New Jersey, volcanoes erupted flows of basaltic or diabasic lava, which entered the seas and covered the sands and clay, very much in the same way as the basalt of the Hawaiian volcanoes is doing at present. These lava sheets were then buried beneath other sandstone beds deposited in the sea.

Approximately at the same geological time, or possibly a little later, lava rising toward the surface was *forced into* the sandstone, between the layers of which it spread out in extensive sheets. In this way the trap of the Palisades was introduced into the rocks. After this the Triassic beds of sandstone and included lava were elevated above the sea, broken by faults and tilted from the horizontal position, so that there were produced alternate beds of lava and sandstone, inclined at various angles. The forces of denudation have removed much material from this series of rocks, and have etched the harder lavas into relief, so that they now stand up distinctly above the surrounding country.* In topographic form they simulate the Appalachian type in the fact that they are usually

* Like the other mountains of the East, the crests of these rise to a nearly uniform sky-line, which, as in the other cases, is interpreted to represent the remnants of the ancient base-levelled land, or peneplain.

ridges, though the ridges are less continuous, and also more curving, generally with a diminution in elevation at one end (Fig. 15).

This may be called the *Palisade type* of mountain, because typically illustrated there. Aside from the instances mentioned in New Jersey, this type finds illustration also in the East and West Rocks near New Haven, Connecticut, the Hanging Hills near Meriden, Connecticut, Mounts Tom and Holyoke in Massachusetts and Cape Blomidon, Nova Scotia. The typical feature is that of a ridge, or a series of ridges, of tilted trap rock, either lava flows or intrusions, etched into relief as are the ridges of harder rocks in other mountains. They differ from the true Appalachian type in the fact that they are monoclinal, and that the ridges are not associated with anticlinal and synclinal folds. Frequently, if not always, the uplift is due to faulting. This is noticeably the case in the Connecticut valley, as has been so clearly shown by Professor Davis.* In passing over this interesting phase in the geographic history of the State, it should be stated that the old volcanic centres from which the lavas came, including the cones, have long since been lowered by denudation. That the volcanic energy was widespread in its effects, is shown by the fact that, from Nova Scotia to Carolina, dikes of this black trap rock cut the strata. The volcanic activity was not manifest far west of the present coast line, but seems to have been most intense approximately along that line. Dikes, apparently of the same age, are found cutting the Devonian shale near Ithaca, N. Y. They abound in the Highlands of New Jersey and of New England.

The Catskill Mountains.†—As was stated in the first part of the article (p. 17), these are not true mountain ranges but rather pseudo-mountains. During the Devonian period, just before the uplift of the great interior Paleozoic sea, which accompanied the development of the Appalachians, the site of the Catskills was the shore line of a sea-bottom that was slowly sinking. The land side of the shore was occupied by the Taconic Mountains, from which sediment entered the sea, where it was strewn over the bottom in the region where the Catskill Mountains now rise. Here, near the coast,

* Davis, Seventh Annual Report U. S. Geol. Survey, 1885–6, 455; Davis and Whittle, Bull. Mus. Comp. Zool. XVI, 1889, 99; Davis and Loper, Bull. Geol. Soc. Am. II, 1891, 415; Davis and Griswold, Bull. Geol. Soc. Am., V, 1894, 515; Davis Am. Journ. Sci., Ser. IV, 1, p. 1; Davis, Pop. Sci. Monthly, 1891, 221. See also Percival, Geology of Connecticut, 1842, p. 299; Dana, Manual of Geology, 4th Ed., 1895, 800; Emerson, Bull. Geol. Soc. Am., II, 1892, 451.

† See references, Bull. Am. Geog. Soc., XXVIII, 1896, 105.

coarse beds of sandstone and conglomerate were accumulated, while further west, shales and sandy shales were being deposited. The sinking of the sea-bottom permitted these beds to gather to

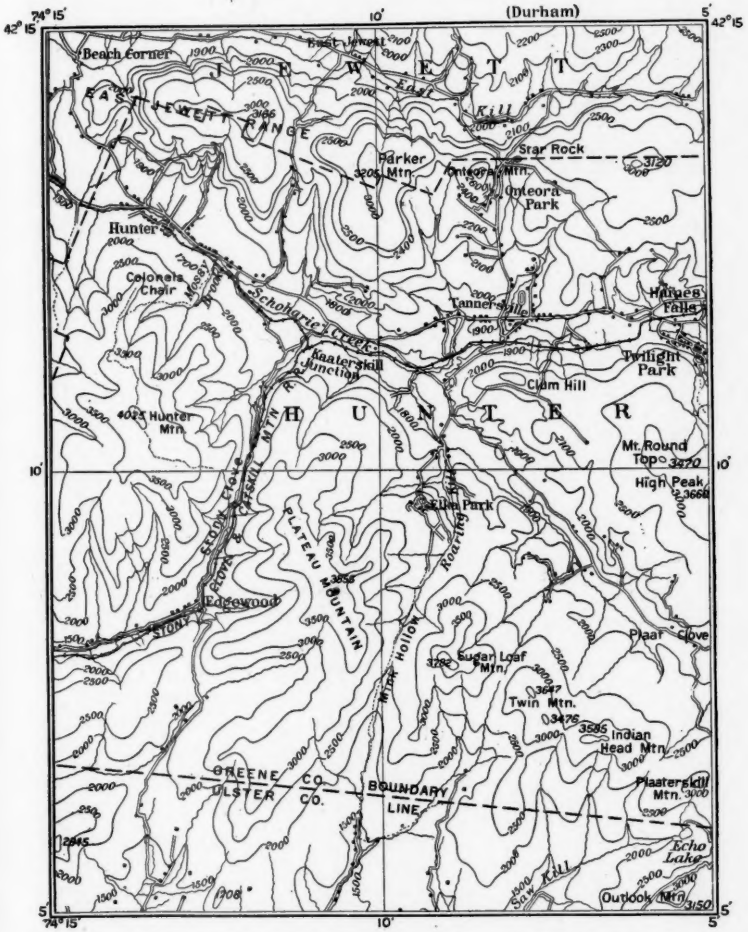

FIG. 16.—MAP OF PART OF CATSKILL MOUNTAINS, CONTOURS EVERY 500 FEET. (MADE FROM U. S. GEOL. SURVEY TOPOGRAPHIC MAP.)

great depth. Then, when the reverse process of elevation had commenced, the sea-bottom was raised to dry land, and eventually uplifted to the condition of a plateau. Possibly the uplift in the

Catskill region was greater than that in central New York, although of this there is no direct proof. But in both places the elevation was accompanied by very little disturbance of the strata, so that in the two parts of the State the upper Paleozoic beds are still nearly horizontal.

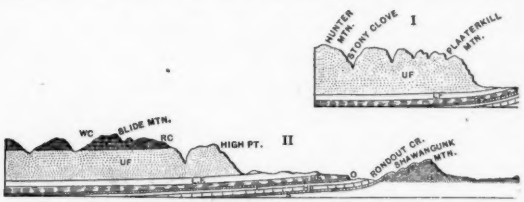

FIG. 17.—CROSS SECTIONS SHOWING CATSKILLS IN ULSTER CO. IN NEW YORK AND THE SHAWANGUNK MTS. ON RIGHT IN LOWER FIGURE. CATSKILLS CAPPED BY HARD SANDSTONE LAYERS (DARTON, 47TH REPT. N. Y. STATE MUSEUM, 1894).

This great New York-Pennsylvania plateau, which borders the western base of the Appalachians, is now considerably dissected. While in most parts it is a fairly level plateau, as viewed from the higher hills, it is, nevertheless, deeply cut by broad valleys. This is true throughout the State, but in the Catskill Mountains the topography is much more rugged and more mountainous than elsewhere. Denudation, operating upon hard rocks of nearly horizontal position, has carved out a complex of peaks (Fig. 16), which, because of the superior hardness of their rocks, rise higher than the rest of the plateau.

As might be expected from the association of the Catskills with the Appalachian uplift, the horizontal rocks of the higher and more typical portion of the Catskill range change gradually (Fig. 17), toward the south and east, into a region of disturbed rocks, thus merging into the true Appalachians. In these sections of the State there is every gradation from the plateau feature to the true folded mountain. The counterpart of the Catskills is found in various parts of the mountainous plateau region on the border between the Appalachians and the real plateau which lies west of their base. This is notably the case in the Cumberland plateau in Tennessee. The same features are present in innumerable places in the great plateau region of the Far West.

This case of the Catskills is an interesting instance of the simulation of features of one geographic type by another of quite a different kind. The life history of the mountain *range* involves folding and uplift of the rocks into complex topographic features. At first denudation increases the complexity, and brings out the variations in rock texture into markedly rugged contrast. The tilted position of the layers, and other complexities of rock position, in-

crease this irregularity. Then as development continues, the ruggedness decreases, and the surface is smoothed over, while the elevation is diminished. This may proceed until old age, when the formerly irregular surface becomes reduced nearly to the condition of a plain.

So also the plateau, with horizontal rocks of varying hardness, etched by the agencies of denudation, commencing as a level surface, becomes more and more rugged and mountainous, until finally it so closely simulates the true mountain that in common usage it takes the name. Then, as denudation proceeds, in this case also there is first produced a less rugged surface, and finally a plain. In the middle and final stages these two diverse forms are as one in surface outline, though so utterly different in internal structure and origin.

The difference between the typical *Catskill type* of mountain and the Alpine ranges of highly folded rock, is striking, when we consider the extremes. But there is no hard and fast line to be drawn between the two. The folds of the mountains die out by degrees, and change from tilted to horizontal strata quite imperceptibly. The folds become less and less intense, and finally entirely disappear (Figs. 17, 18 and 19). Where in this gradational area are we to define the boundary between the mountain and plateau? For instance, in the vicinity of Chattanooga, Tennessee, is the Lookout Mountain, with its nearly horizontal limestone, capped by sandstone, a mountain or a plateau? It is a part of a broad syncline, quite flat-topped and elevated because of the greater resistance of the upper sandstone beds. Calling this a true mountain, as we apparently must, what of Walden's Ridge, to the west of Lookout? This is still gently folded, but is a much broader and more typical plateau. Still to the west of this, and west of the Sequachee valley, is the Cumberland Plateau, where the rocks are nearly horizontal, and practically beyond the

FIG. 18.—CROSS SECTION, SHOWING CHANGE FROM MOUNTAIN FOLDS TO PLATEAU, TENNESSEE (HAYES, U. S. GEOL. SURVEY, FOLIO 3).

FIG. 19.—CROSS SECTION, SHOWING PLATEAU FORM OF MOUNTAIN, WALDEN RIDGE (RIGHT HALF) (HAYES, U. S. GEOL. SURVEY, FOLIO 6).

zone of folding. No doubt this should be called a plateau and Walden's Ridge probably a mountain; but wherein lies the essential difference?

Here, as nearly everywhere, the one who would classify is confronted by the difficulty that we wish to draw distinctions where none really exist. The *typical* species of animals and plants, or of minerals and rocks, or of geographic forms, are easily separated and defined; but when we examine them further, we find them grading one into the other and the definition no longer defines, nor can the distinction longer be followed.

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THE CONSOLIDATION OF THE IROQUOIS CONFEDERACY;

OR,

WHAT HAPPENED ON THE ST. LAWRENCE BETWEEN THE TIMES OF CARTIER AND CHAMPLAIN.

BY

JAMES DOUGLAS.

The sixty-five years which followed Cartier and Roberval's futile attempt at colonization in the valley of the St. Lawrence in 1543 composed the dark age of Canadian history. A desultory trade was no doubt carried on with the Indians of the St. Lawrence between 1542 and 1608. Jacques Noel, Cartier's nephew, writing in 1553 to Moses Growte, corrects some inaccuracies on a certain map of North America dedicated to Mr. Hakluyt, which had been shown him, by referring to his own observations and to a map of his uncle's, which he says has been lent to his two sons, Michael and John, then in Canada: and he promises that if on their return he learned from them anything new worth recording he would communicate it. But there is no reason to suppose that any of these traders extended their operations beyond the limits of Cartier's explorations, which reached Hochelaga, the present site of Montreal, at the junction of the Ottawa and the St. Lawrence. They more probably confined them to the mouth of the Saguenay, for Tadousac was a great centre of Indian barter when Champlain founded his colony in 1608, and probably was then, as Lake St. John now is, a rendezvous of the Algonquin tribes, who hunted for skins over the Labrador promontory and wandered northwesterly to the very land of their kinsfolk, the Crees.

But during this blank in the annals of the St. Lawrence a revolution was being enacted there, which these transitory visitors from Europe did not deem worthy of recording, but which was to have momentous effects upon the fate of both the white and the red men east of the Mississippi for nearly two centuries. As bearing on the origin of the Indians occupying the shores of the Gulf and the valley of the river St. Lawrence, Cartier's narrative gives some fragmentary evidence. On his first voyage in 1534, when he explored only the Gulf of St. Lawrence, he came in contact with

the Labrador Indians, with whom French fishermen had been trafficking for a generation. But when he landed on the present coast of Nova Scotia and New Brunswick he met and bartered his trinkets with Indians who, he says, "had not the same character or language as those he had first seen." "Their dwellings were," according to his limited observation, "overturned canoes, under which they lay on the bare ground." They were probably Indians of the upper St. Lawrence, either on the war-path or on a hunting or fishing expedition. From the last point which Cartier touched on the south shore on this his first voyage, which he called Honguedo—probably Gaspé Basin—he abducted two youths, Taiguragny and Domagaya. Thence he returned to the Labrador coast, partly circumnavigating the island of Anticosti, and the season growing late, started for France.

On the second voyage, made the following year, he was accompanied by his two Indian captives. When his ships reached the north channel, between Anticosti and Labrador, his captives, who seemed perfectly familiar with the geography of the whole country, described the great river which flowed into the gulf from the west. Evidently acting on their information, he ascended the St. Lawrence as far as Stadacona, the site of Quebec. That point reached, he at once put two of his vessels into winter quarters in a small affluent of the river St. Charles. He was received with every demonstration of friendship by Donnecana, the Chief of Stadacona, and his people, whom he found to be of kin to his two captive youths, though he had kidnapped them from a point 300 miles further down the river. These youths spoke the language of Stadacona, and we are led to infer that the fact of their capture was known to their kinsmen of that tribe. It was even claimed that one of the children given to Cartier as a hostage by Chief Donnecana was a brother of one of the captives. But as soon as Cartier expressed his determination to ascend the river in his smallest vessel, the *Emerillon*, and demanded the fulfilment of the promise of his two former captives that they go as his guide, Chief Donnecana, by persuasion and intrigue, used every effort to frighten and deter him from making the attempt, and forbade his tribesmen from accompanying him. Alone he therefore sailed up the great river. Both banks above Stadacona were peopled by Indians who made no effort to oppose his progress, but on the contrary, eagerly supplied him with fish, musk-rats, and other articles in exchange for the trifles he had brought with him for barter. On the 28th of September, or nine days after starting, they entered Lake St. Peter,

and next day, failing to find the channel, he left the *Emerillon* in charge of some of his men and proceeded in his boats. On the second of October they reached Hochelaga. Cartier gave to the magnificent mountain which rises so symmetrically from the river the name it still bears, and which it has given to the city which lies at its base and is climbing up its sides. On the bench, from which the steep slope of Montreal Mountain begins to tower, the Indians had built a large stockade village or *bourgade*. Though the narrator probably indulges in a traveller's license when he says that "over one thousand villagers gathered on the banks to greet them with the fervour of a parent welcoming his child," the population of Hochelaga was unquestionably great. The *bourgade* is described as round in shape and compassed by a stockade of three rows of stakes; the middle row perpendicular, the outer rows inclined towards it. The palisade was two lances high, and at several points adjacent to the palisade were elevated platforms, reached by ladders, on which were piled rocks to be used as defensive weapons. The enclosure was entered by a narrow gate. Within it were 50 lodges, each 50 paces in length and 12 or 13 paces in width. In the centre stood a common lodge. Cartier remarked a notable difference in their mode of life from that of the Stadacona Indians. He says "this people depended entirely on agriculture and fishing." "They take no account of the things of this world, being ignorant of their existence." "They never leave their home, not being migratory like the people of Canada, the Saguenays, who, nevertheless, with eight or nine other tribes living on the same river, are subject to them." The next description in contemporaneous history of the Indian village is that given by Champlain when, in 1615, he penetrated into the Huron country on the Georgian Bay on Lake Huron, and rested at the *bourgade* of Carhagouha, where the Recollet Fathers had already established a mission. He said it was surrounded for defense with a triple palisade of wood 35 feet high. But when he reached the Iroquois villages to the south of Lake Ontario, which he had been induced by his Huron allies to assist in capturing, but which successfully resisted their joint attack, he found another palisaded town of the same general plan and defences of the same construction, "though much stronger than the villages of the Allegonantes (Hurons) and others." The resemblance between the stockaded town of Hochelaga as described by Cartier, and those of the Huron and the Iroquois as described by Champlain, is significant.

Cartier's historiographer is unfortunately less precise in his

description of the dwellings and constitution of the *bourgade* of Stadacona over which Chief Donnecana ruled than in that of the construction and the government of Hochelaga. He tells us, it is true, of the demonstration, first of fear and then of welcome, made by the savages on their first coming—of the recognition of the two captive youths—of their opposition to his ascent of the river, of the haste Donnecana made to pay a visit of ceremony to the ships after Cartier's return from Hochelaga, and how he invited Cartier to Stadacona. The invitation was accepted and the visit paid on the following day, when Cartier, the gentlemen of his suit and fifty sailors, marched a league to the *Demeurance* of Stadacona, which was probably on the promontory overlooking the St. Lawrence and the St. Charles. The savages received him with their customary dances, and exhibited in proof of their prowess five dried scalps, but at the same time they admitted that one of their war parties had been almost totally exterminated two years previously in the lower St. Lawrence by Toudemous, a tribe no commentator has been able to identify, and they cried for vengeance. It was the approach toward negotiations for an offensive alliance against their enemies, to which Cartier did not respond. The coolness evinced in the subsequent conduct of the Indians may have dated from this visit. The narrative tells further of the half-hearted assistance the Indians extended him during the trials of the terrible winter spent on the St. Charles, and of certain of their domestic habits as he interpreted them. But we look in vain for a description of their dwellings, of their tribal government, or of other details, such as are given regarding Hochelaga, which would enable us to identify them without contradiction with one of the other of the great Indian races which occupied this section of the Continent—the Iroquois and the Algonquins.

We gather, however, that there were a number of Indian villages on this reach of the St. Lawrence, of which Stadacona was the principal. On Cartier's return from Hochelaga the attitude of the Indians of Stadacona gave him grave concern. Through the machinations, as he believed, of Taiguragny and Domagaya, his quondam captives, the alienation of the Indians of Canada became so menacing that, fearing hostilities, he protected his fort by a deep ditch and made the utmost parade of his small force. But no attack was attempted. In fact his apprehensions were probably groundless, and may have been due to suspicions instilled into him by Hogauchuda, the chief of a neighboring village, who was jealous of, or had a grudge against, Donnecana. Where that village was staked

he does not tell us, but he adds, as it were, parenthetically, that "in the district of Canada," that is, west of Isle Aux Coudres and east of some point around between Stadacona and Hochelaga, there are several communities living in villages not stockaded—"*villages non clos*"—which expression may be intended to distinguish them as a group, including Stadacona, from Hochelaga, or merely to imply that they were small and not stockaded, in distinction of Stadacona itself. He continues, "At the end of and to the west of that Island" (the Island of Orleans), "there is a basin which forms an admirable harbor into which the river flows with a swift deep current between high bluffs. On them the land is cultivated, the soil being as rich as eye could wish to rest on." "Here is built the town of Stadacona, and the lodges of Chief Donnecana and of the two lads we captured on our first voyage." "But before reaching Stadacona four villages are passed, those of the Ajoasté, Starnaham and Tailla, which latter was built on a hillside, and of the Satadin." As Tailla is distinguished as being built on a hill, we may presume that it alone stood on the high south shore, the others on the Beauport Flats. "Then Stadacona is reached, beneath whose high cliff towards the north is the river and harbor of St. Croix, where our ships lay high and dry from the 15th of September to the 16th of May, 1536. This place passed, the villages of Téquenoudy and Hochelay are reached, the former on high land, the latter in a valley." All we know is that Hochelay was above Cap Rouge, for when on his third voyage Cartier started on what he intended to be a preliminary survey of the St. Lawrence above the Lachine Rapids, after leaving their winter quarters at Cap Rouge, the narrative says, "we proceeded up the river, and the captain paid a visit to the Lord of Hochelai, whose abode is between Canada and Hochelaga." Strange to say, Hochelaga itself is not even mentioned by the narrator of this third voyage as having been visited, but on the return of the expedition the Lord of Hochelay was absent, concocting, as they afterwards learned, hostilities against them with the Indians of Stadacona. The resemblance of the names Hochelay and Hochelaga links their inhabitants as belonging to the same stock.

But to return to Cartier's references to the aborigines on his second voyage. After the dreary winter had passed, Cartier hastened to depart with two ships—his smallest and his largest—his crews, decimated by scurvy, being too reduced in number to man all three. He was anxious to carry back with him not only his former captives, but an actual Indian chief. But the people of Stadacona, suspecting treachery, refused to assist the visiting ships.

On the other hand, Cartier's fears had been excited by the unusual gathering of Indians at Stadacona. They were probably only parties of hunters returning from their winter chase. For again Cartier's suspicions had been fanned by the insinuation of some new allies of his, the inhabitants of Stadin, doubtless the same as Satadin previously mentioned as the nearest to Stadacona of the chain of unstockaded villages which lined the south shore. In return for their friendship and their hints they were allowed to dismantle the abandoned ship for the sake of its nails.

It was through his body-servant, Charles Guyot, who was a favorite and had been a guest of Donnecana, that he succeeded in allaying that chief's suspicions and ultimately in trapping him and others. He secured their confidence by entering into negotiation for the capture of a certain chief Agona, who seems to have been obnoxious to Donnecana. Cartier pretended that his instructions were to carry to France no adults, but only people who had been instructed in the French language and in the Catholic faith. But he professed himself willing to transport their enemy to an island of Newfoundland and put him on shore, where he would certainly cease troubling them. Their apprehensions being thus allayed, they consented to attend the ceremony of the Elevation of the Holy Cross. Twelve of them were trapped and carried over to France.

The facts as above sketched bear out the following conclusions: That there were either sedentary or wandering branches of the Stadacona Indians on the south shore of the Gulf of St. Lawrence, and that they differed in language and habits from those of the north shore of the Gulf; that the Stadacona Indians were sedentary, and cultivated lands; that from Cartier's specifying that certain of the surrounding villages were unenclosed, we may infer that Stadacona was stockaded; that there was jealousy between the Stadacona Indians and their near neighbors, though from their living in villages we may infer that they were probably racially allied and differed from the wandering tribes of the Algonquins; that there was a chain of villages between Stadacona and Hochelaga inhabited by Indians of similar habits and customs, and, therefore, of like lineage; that towards the close of this first attempt of colonization by France one, at least, of these communities allied itself with Stadacona to oppose the French intruders; that at the junction of the St. Lawrence and Ottawa was the largest and most powerful of these families or tribes, living in a strong stockaded village and exercising a certain control, if not coercion, over the Indians of the lower St. Lawrence; that if there was not hostility

between them there was at least acute distrust of each other by the Indians of Stadacona and Hochelaga. The inference is that all of these Indians were of one race but of different tribes, and that there were operating causes of disunion under which they were segregating themselves into allied groups.

That they belonged to the same race Cartier himself believed, for to the close of his first voyage he, or his historiographer, appends a list of words which he calls "*Le Langage de la terre nouvellement descouverte, appellée Nouvelle France,*" and he closes his second with another list of words and phrases from "*Le Langage des pays et royaulmes de Hochelaga et Canada, Aultrement appellée par nous la Nouvelle France.*" The majority of the words of the same object in the two lists closely agree. As he met on his first voyage only some travelling bands of the Indian tribe of Stadacona, and as the second list of words is stated to be from the language of Hochelaga as well as of Canada, we have thus corroborative evidence that the language of both *bourgades* was substantially the same.

That the Indians of Hochelaga belonged to the great Iroquois family the minute description of the stockaded village and of its internal organization leaves no room for doubt; and if all the Indians of both Hochelaga and Canada, that is, of the whole valley west of Isle Aux Coudres, spoke the same language, then the whole of the St. Lawrence between the Gulf and Ottawa was occupied by one or more of this powerful race. Mr. J. C. Pilling, in the preface to his Bibliography of the Iroquoian Languages (Bulletin of the Smithsonian Institute, 1880), referring to the Cartier vocabularies, says, "To the Iroquoian, perhaps, belongs the honor of being the first of any American family of language to be placed on record." Sir Daniel Wilson, in the second volume of the Proceedings and Transactions of the Royal Society of Canada, compares Cartier's words for the numerals with corresponding words in the dialect of the Huron Indians of Lorette near Quebec. The resemblance is occasionally so close as to support a presumption of Indian linguistic affinity despite the dissimilarity between some of Cartier's words and their representatives in the modern dialect; a dissimilarity so wide that the imagination of the most ingenious philological casuist would find it difficult to bridge it. For instance, among the numerals are the following:

	HOCHELAGA AND CANADA.	LAURETTE, MODERN HURON.
1.....	Secata	Skat
3.....	Asche	Achiu
5.....	Ouiscon	Visch
10.....	Assem	Asen

In another table Sir David Wilson gives on the authority of Mr. Horatio Hale the corresponding words from Cartier and the language of the Wyandots, a branch of the Hurons, now living in Anderdon Township, Ontario. Here again we find close resemblance, and as might be anticipated, wide divergence; for apart from the change which would inevitably take place in unwritten speech in the three intervening centuries, Cartier's philologists cannot have followed very definite rules in expressing the inflexions of the Indian language by the European alphabets, nor could he have had much opportunity of correcting the idiosyncrasies of the individual pronunciations or the peculiarities of dialect of his few guides, by any widely extended comparison. Charlevoix's evidence, though given in 1744, is not of much value. He says the inhabitants of Hochelaga spoke the Huron language. Cartier's evidence is of more value when he states specifically that the vocabulary he gives is that of words and sentences spoken by the inhabitants of the two villages and tribes of Stadacona and Hochelaga. The incidental references to correspondence in manners and organization confirm the linguistic evidence of the racial units of the two communities and of their essential differences from the Indians of the Algonquin stock, which then inhabited the north shore of the Gulf and of the lower St. Lawrence.

When Champlain visited Stadacona and Hochelaga in 1608, only 65 years after Roberval withdrew his company of unsuccessful colonists, and only 66 years from the date of Champlain's third departure, the Iroquois name of Stadacona had given place to the Algonquin name of Quebec.* There were on the St. Lawrence no populous stockaded villages occupied by a sedentary population with the crude social and political organization of the departed race. He found only scattered bands of nomadic Indians of the Algonquin race.

The Huron inhabitants of the *bourgade* of Hochelaga (if we assume they were Hurons), had migrated to the shores of the Georgian Bay on Lake Huron,—but the descendants of Donnecana,—where were they? Were they with their kindred on Lake Huron, or had they been driven from their picturesque fastness or

* We assume that Champlain means, when he says it was so called by the Indians, that Quebec was its Indian name, as Kebec is the Micmac word for a contracted water-way. We may accept that as the origin of the name in preference to the fanciful myth that Champlain or one of his comrades on first seeing the magnificent promontory jutting out between the St. Lawrence and the St. Charles exclaimed "Que'Bec!"

voluntarily abandoned it in favor of the more temperate valley of the Mohawk? Indian tradition assigns as the cradle of the Indian Huron-Iroquois race the land south of the St. Lawrence and between it and the sea. Another tradition places the cradle of the race on the Lakes, and makes the tribes migrate first towards the sunrise as far as the sea before they return to their ancestral inland home. (Beecham's Iroquois Trail, page 11.) Whichever tradition reflects the truth, they both assign to the Iroquois stock the temporary abode where Cartier and Roberval found them dwelling in the first half of the 16th century. In further confirmation of this tradition we find Indian tribes belonging to the same stock occupying the seaboard as far south as Florida. The Cherokees, for instance, possessed ethnical traits and exhibited linguistic peculiarities which linked them to the Iroquois stem. They also displayed all the native prowess of the stock from which they sprung. But while these offshoots of the race may have remained upon the seaboard, the race itself developed into its most distinctive type in the tribes of the Hurons and of the Iroquois-Confederation. The Hurons, when we came to know them distinctly as such, occupied the eastern shore of the Georgian Bay and were at bitter feud with their brethren of the Five Nations, whose stockaded towns extended over the Genesee and Mohawk valleys south of Lake Ontario almost from the Niagara River to the Hudson. There was another tradition current among the Hurons, as recorded by the Recollet and Jesuit missionaries, that they had been driven from their former abode on the St. Lawrence by the Senecas. The Wyandot historian, Peter Dvoyentate, states that the Senecas even occupied with the Hurons the island of Montreal. (Sir D. Wilson, Transactions of the Royal Society of Canada, Vol. 2.) If, as is almost certain, the stockade of Hochelaga was inhabited by the Hurons, it is not a forced conjecture to infer that the Indians of Stadacona belonged to another branch of the Iroquois family and that they may have been the ancestors of the future Senecas. Their vacillating relations with Cartier would be thus explicable. At first friendly, they at once assumed a suspicious and almost hostile attitude as soon as he expressed a determination to ascend the river to the headquarters of their enemies, the Hurons. If they had hostile designs against the Hurons, they would employ every device of Indian diplomacy to prevent the Frenchmen with arquebuses and cannon from coming into friendly contact with their foes. Why they did not at once propose an offensive alliance and a war-like expedition, as the Algonquins did to Champlain in the next century, may be due to the promptness

with which Cartier acted, and the indifference he displayed to their co-operation. Iroquois tradition dates the formation of their great confederacy back to the 14th or 15th century, but though the first imperfect plans and constitution may then have been formed, the growth and consolidation of its power was gradual. Even after its normal development was interrupted by European interference, we see the Five Nations absorbing a Sixth, and strengthening the depleted forces of confederation by the incorporation, after their defeat, of a distant and previously hostile branch of the race. Although, therefore, the confederacy may have been established in the Mohawk country and the groundwork laid of its future power, when Cartier found the Iroquois occupying the valley of the St. Lawrence, it was probably only beginning to experience the enormous force inherent in consolidation. Its astute statesmen, for such they doubtless were, had formulated the distinct policy of gathering into a restricted area, where the agricultural capabilities were great and whose strategical position was strong, the most powerful and warlike members of the great scattered family. Of these members the Hurons were the most conspicuous, but they were probably so powerful and numerous as to be unwilling to merge their independence into the Mohawk confederacy, and abandon their favorable site at the Junction of the Ottawa and the St. Lawrence. Yet if they refused to enter, and declined to consolidate their forces with those of the confederacy, their separate existence would be a standing menace. They would be certain to become the nucleus of another confederation which would be hostile to and perhaps destructive of that already formed; and therefore the aim of the Mohawk chiefs would be to annihilate, if they could not absorb it. Cartier tells us that the Hochelaga tribe, whom we have supposed to be Hurons, were already so strong as to dominate over the Indians of Stadacona and the lower St. Lawrence. The Mohawk confederacy had therefore allies already made, or tribes inclined to be allies, in the kindred Indians to the east of Hochelaga. In the interval between Roberval's departure and Champlain's appearance on the scene the Mohawk confederation probably swept down on Hochelaga, and, with the aid of the Stadacona-Iroquois, dislodged the Hurons and obliged them to migrate to some other locality. The locality chosen by the Hurons would necessarily be one at what they considered a safe distance from the Iroquois canoes, and where they would have space in which to grow, and to create by affiliation another confederation with which to oppose their implacable enemies. No better spot could have been selected than the shores of Georgian Bay.

Between them and their enemies there lay beyond Lake Ontario the whole peninsula of western Ontario peopled by the Attivendaronks or Neutres, the Tiontates or Petuns and other tribes of the Iroquois stock who, if not their allies, dreaded the power of the confederacy as acutely as they did themselves.

The story of what befell them in their retreat on Lake Huron and how at length they returned to the St. Lawrence under the protection of the French, forms an integral part of the history of New France during the 17th century. In fact that history was shaped in a great measure by the complications which sprung out of the French entanglements in Huron wars and politics. These subsequent events are matters of history. The tragedies, however, which were enacted in this dark corner of the continent during the half century or more of obscuration following Cartier's and Roberval's departure, can be a subject for speculation only. But it is a dramatically interesting one. We cannot imagine that the small migratory bands of hunters without organization or policy, whom Champlain found on the St. Lawrence, destroyed the stockaded town of Hochelaga after subduing the populous tribes of Stadacona and its vicinity. It was only when the combined strength of the Iroquois of the east and of the west had crushed the Huron Iroquois that the poor wandering Micmacs, or whoever the Algonquins may have been, ventured to enter on the vacated territory. The Stadacona Indians may have been Senecas, but whether they were or not, if they were the allies of the Mohawks in this their first Huron war, it was in obedience to the wise policy of consolidation that they abandoned their home, which was too far from the centre of consolidation to be safe, and removed to some other territory contiguous to that already occupied by the confederated nations. If they were what was afterwards known as the Senecas, they became the left wing of the forces of that powerful group of war-like communities and occupied the shores of the beautiful lake of that name, to the west of the Onondaigas, who probably then occupied the country between Oneida and Cayuga lakes. They therefore formed the westerly bulwark between the other members of the compact and the Hurons. They must have been the most obnoxious of all the Iroquois nations to that most harassed member of the family. It was consistent therefore with the existence of this grudge that, when the Hurons in 1616 secured the co-operation of Champlain on one of their war-like expeditions, they should lead him to attack the Senecas.

If my supposition be correct the sixty-five years of dense obscurity covered the critical period in the history of the Mohawk

confederacy. It had, we may assume, been created and its general policy been framed during the previous centuries. That policy was that of incorporating into the confederacy friendly branches of the parent stock if they would adopt their principles and merge their individuality into the unity of the League, but of ruthlessly crushing, to the extent of annihilation, all rivals and relentlessly and perseveringly waging war of revenge. The confederacy probably then consisted of not more than four so-called nations. But it was becoming sensible of the power of combination, when there sprang up on the St. Lawrence another highly organized nation with similar institutions and instincts and presumably kindred aims, which would be sure to gather to itself in a rival and therefore necessarily hostile combination the tribe or tribes, presumably the Senecas, occupying the lower St. Lawrence. There were already signs of coöperation even at the period of Cartier's third voyage. We have seen how the chief of Hochelaga was combining with the chief of Stadacona against him. There was evidently therefore danger in any other confederation, whether it were grouped around the Stadacona or the Hochelaga tribe, to the Mohawk supremacy. And therefore by means of diplomacy and war the Huron hopes and Huron influence were crushed and the Iroquois of Stadacona first secured as allies, and then drawn in from the St. Lawrence and incorporated into the confederacy. They then formed the fifth Nation of the League and added more than a fifth to the terror which their valor and discipline cast over the whole middle section of eastern North America. It is strange that events and incidents so important and so recent should have failed to be recorded by the missionaries who soon after made their abode among the Hurons; for oral tradition is almost undying among the Indians; and there must have been aged men and women on the Georgian Bay who had been born at Hochelaga and remembered the great migration. But the critical bias of the historical spirit was not strong in the early colonists of New France, and even Champlain was no exception. Thus it came about that a complete revolution, which was most momentous and which produced grave consequences during the early course of Canadian history, remains untold and can only be guessed at—a curious example of how short a space of time may be required for great national changes to take place, and all record of them be obliterated, when neither architectural monuments nor written literature exists to commemorate past or record current events. We can only conjure up in imagination what happened in the formal councils in the lodges of the Iroquois and Hurons; the protracted negotiations

between the rival confederacies; the gravity and earnestness with which the alternatives of peace or war were discussed; the care with which the plans of the campaigns were elaborated, after all possible alliances had been secretly made; the attack in force upon the Hochelaga stockade; the failure to destroy it by the *coup de main;* then the ceaseless harassment by small bands of Iroquois of every party of Hurons which ventured beyond the stockade, till their fields lay waste and the river with its fish, though in sight, was made virtually inaccessible. The Hurons were evidently too strong be to conquered and annihilated and too independent to accept absorption, but yet too weak to become aggressive or to defend themselves. The war was doubtless waged with every aggravation of horrid cruelty, and with the same fiendish ingenuity and barbarity with which the second war against the same Hurons in the next century was prosecuted. Hochelaga was probably not abandoned till the retreat of so much of the nation as survived became the only alternative to annihilation. When they decided to retreat they must have escaped from their magnificent position, magnificent then as now, at the meeting of the two great water-ways, at a moment when their enemies were off the scent. The line of flight must have been by canoe up the Ottawa and the Mattawa over Lake Nipissing and down the French River into the land-locked recesses of the Georgian Bay, which they evidently thought would be a safe retreat.

While these politicians and warriors in the dense forests of America were framing policies, negotiating alliances, plotting one another's destruction, waging bitter war with relentless ferocity, and with sleepless vigilance watching their opportunity to kill and torture; while their fleets of canoes were being stealthily paddled to points of attack or were noiselessly carrying them to some secluded place of safety; while these wily savages were thus playing the game of statecraft and of war with no great world looking on to applaud or reprobate, but with an energy as intense and with cunning as astute as if a drama were being enacted on a vaster field and the issues were of world-wide interest, the same qualities were being exercised on the other side of the sea, but amidst different surroundings and with different results. Nevertheless, what transpired during those sixty-five years in the hidden recesses of that great silent land, the building up of the Iroquois confederacy, the migration of the Hurons to the Georgian Bay, and the abandonment of the St. Lawrence, were incidents of no slight importance in giving tone and direction in the early history of New France, of New

Amsterdam and New England. At the same time, momentous events were transpiring in Europe which made the same sixty-five years the most pregnant of any half century in the history of the world, for they created and brought into play the forces which led to the colonization of North America by rival nations, impelled by antagonistic impulses and principles.

ECONOMIC IMPORTANCE OF GEOLOGICAL AND PHYSICAL CONDITIONS IN TROPICAL AMERICA.

BY

FRANCIS C. NICHOLAS.

It may be affirmed that in Tropical America there are vast regions of unoccupied country capable of supporting an extensive population, of adding enormously to the productive wealth of mankind, and on which many have already become enduringly prosperous; while there are other equally extensive regions in which human life

MAP OF TROPICAL AMERICA NEAREST TO THE UNITED STATES.
The shaded portions represent unfavorable districts.

has been sacrificed in the effort to secure wealth, apparently within easy reach. The conditions, physical or geological, that help to produce results so different are worthy of more attention than they

have received. In submitting observations gathered from an extended experience, my hopes are that, however imperfect, they may be of some service by calling attention to the healthful productiveness of some regions and the unwholesome luxuriance of others, with a few reasons why this should be so in Tropical America.

I have stood where former attempts at colonization have been obliterated in the jungles, with no mark or trace left to indicate the graves of those who went expecting ease and fortune, but found only disappointment and death. Then, on the other hand, I have frequently had for my travelling companions wealthy planters returning to their estates, or on their way to Europe or America to spend their thousands in an annual vacation.

Geographically it is difficult to distinguish with absolute certainty among the various regions, and frequently the favorable and the unfavorable districts lie side by side, but the physical features give some data for comparison.

In a general way it may be said that low lands should be avoided, and that the hill country is favorable; but to this rule there are some exceptions.

The accompanying map gives an outline of the general features of those parts of Tropical America lying adjacent to the United States, and roughly indicates the favorable and unfavorable localities as ascertained in part by numerous explorations in the countries noted, in part by study and comparison of the known physical conditions. These are:

1ST. ATMOSPHERIC.

a. The free circulation or absence of the trade-winds, or the presence of local currents.

b. Regions of atmospheric stagnation.

c. Excessive rains or unusual irregularity of the seasons.

2D. PHYSICAL.

d. Natural drainage, its facility, or the contrary.

e. The frequency of floods, or their natural absence.

3D. GEOLOGICAL.

f. The presence or absence of swamps.

g. The condition of alluvial deposits.

h. The immediate underlying strata. Porous or impervious, near the surface, or at a depth.

i. The water supply.

The free circulation of air (*a*) is a well-known advantage. The trade-winds blow continuously, but die away as they approach large

bodies of land. Where conditions are favorable they can be felt for a considerable distance back from the coast.

A body of high mountains near the coast has a tendency to check the trade-winds or to draw them out of their course, and protected valleys in such mountains are apt to be unhealthy. If the ranges are broken, if there are long rivers making their way among them, or if the axes correspond to the usual track of the trade-winds, local currents can be expected.

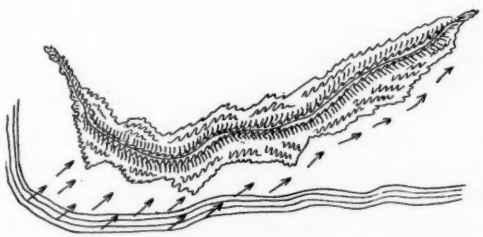
The checking of the trade-winds by a mountain range has a tendency to create zones of stagnation in the lower atmosphere (*b*). Such a range may draw the air currents toward its summit, and if there is open country behind or long valleys open in the track of the wind, but at a considerable elevation above the zone of stagnation, the winds find an outlet and continue on their way. With low-lying valleys the winds would find a way over the flat country and no zone of stagnation would be formed.

Where mountains lie near the coast, directly in the track of the trade-winds, and especially where their axes correspond to such winds, excessive rains (*c*) can be expected, sometimes over a very long stretch of country, and at such localities the well-known wet and dry seasons of the tropics are scarcely known.

GRADUAL ELEVATION FAVORABLE TO THE CIRCULATION OF TRADE-WINDS.

ABRUPT ASCENT, BROKEN RANGES FAVORABLE TO LOCAL AIR CURRENTS.

ABRUPT UNBROKEN ELEVATION FAVORABLE TO THE FATAL ZONE OF STAGNATION.



MOUNTAIN CHAIN NEAR THE SEA CONDUCTING THE TRADE-WINDS ALONG ITS FLANK, FAVORABLE TO EXCESSIVE RAINS ON THE EXPOSED SIDE, DRIER ON THE OTHER SIDE IN PROPORTION TO HEIGHT AND EXTENT OF MOUNTAINS.

Natural drainage (*d*) is of the greatest importance, and unless the lands are favorably situated in regard to this matter they are

assuredly fatal. By natural drainage is meant either a clean, gravelly soil, or a continued system of water-ways having a regular unchecked descent. Rivers meandering through low, alluvial formations do not necessarily indicate sufficient drainage, even though their waters may be passing with considerable rapidity and great volume.

Such rivers are subject to floods (*e*), one of the most disastrous conditions to be contended against in Tropical America. To detect and avoid a flood line requires careful study. Floods always leave sediment behind, and regions subject to them are usually flat, with low terraces or undulations marking the varying stages of the water. In some cases, though the land is not actually flooded, the rivers, swollen to their limit by the rainy season, which comes regularly in all low lands, are not sufficient to carry off the water, and thus lands that a little before were dry and promising become almost impassable swamps.

Frequently a river that in the dry season is forty feet below its banks will overflow them in the wet season, and this is most likely to happen if there are sand dunes or alluvial ridges piled up toward the sea.

OUTLINE OF LOW-LYING ALLUVIUM, SHOWING EXAGGERATED FLOOD MARKS. SUCH DEPOSITS ARE FREQUENTLY CUT BY NUMEROUS WATER-COURSES, THE BEDS OF WHICH ARE AT A LEVEL WITH THE MAIN RIVER WHICH IMPERFECTLY DRAINS THE COUNTRY.

OUTLINE OF HEALTHY ALLUVIUM, INTERSECTED BY NUMEROUS WATER-COURSES THE BEDS OF WHICH ARE ALL HIGHER THAN THE MAIN RIVER DRAINING THE COUNTRY.

The geological conditions (3d) are very important. The character of the soil is not of great moment, and fertility is the rule; but the physical outlines indicating the geological structure should be studied with care. In Tropical America there is a diversified country comprising low alluvium, rolling foot-hills, steep mountains, high interior valleys and broad table-lands. All these may be contaminated by the presence of swamps (*f*), more numerous in the low lands and very unusual in the higher mountains.

Swamps that can be seen and provided against do not constitute

so serious a danger as others that fill up in the wet season and become dry shortly after the rains have passed. Such swamps are particularly met with in valleys where the rivers have cut a narrow channel at their outlet, not sufficient to carry off greatly increased volumes of water; also on hill and mountain sides where tilted strata form troughs to retain the water, wherever the underlying strata form basins to retain the surface water, and in low alluvial deposits imperfectly drained.

The structure and condition of alluvial deposits (*g*) is important. It may be safely stated that all recent alluvial deposits are dangerous, particularly those containing silt and partially decomposed vegetable material. Such deposits may be known by their even texture and frequent inclosures of bits of wood beginning to carbonize, with leaves, straws, grasses, etc., but partially decomposed. Older alluvial deposits, which are frequently very desirable, have a firmer appearance, generally considerable coarser material mingled with them, and may contain bits of lignite or possibly impressions of leaves and grasses where clay is bedded in the alluvium.

Shales, marls, clay-beds and limestone or other massive rocks may form (*h*) the underlying strata. If these dip so as to facilitate a convenient drainage, they are favorable, but if their tendency is

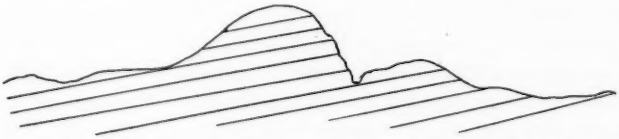


DIAGRAM ILLUSTRATING UNDERLYING STRATA FACILITATING DRAINAGE ON ONE SIDE OF A RANGE OF HILLS, BUT IMPEDING IT ON THE OTHER.

DIAGRAM TO ILLUSTRATE HOW RESIDUAL CLAYS OR UNDERLYING IRREGULAR STRATUM MAY FORM BOG HOLES, OR IF THE SURFACE IS DENUDED POOLS IN WHICH STAGNANT WATER COLLECTS.

to retard the flow of surface water, they are very undesirable, especially if too near the surface, in which case pools of stagnant water are formed, and the emanations are generally fatal to foreigners. The water supply (*i*) is of the greatest importance; it is everywhere abundant, but the question of quality is a serious consideration. In a country that is geologically well endowed the

springs will be clear and abundant, the brooks rapid and unchecked, and such water is perfectly wholesome; but if these same rivers have passed through regions of impeded drainage, they are frequently very dangerous. Spring runs and brooks in recent alluvium should be avoided, and the danger from water draining swamps needs no comment. In the low lands water from the largest river is generally safest.

Generally speaking, the presence of aboriginal remains may be considered favorable, because in the old days people native to the soil naturally sought out the best locations.

These notes and diagrams are made with a view to the economic as well as the scientific interest in the superficial conditions of Tropical America. The question of the eligibility of lands and the reasons, geographical and geological, why some are desirable and others probably fatal, may be worthy of attention from intending settlers. For general information it can be stated that:

A region well endowed will have : Facilities for the free circulation of the trade-winds, or for the development of local air currents. A free drainage, the country sloping to conduct surface water continuously to the sea. The underlying strata will afford facilities for natural deep drainage. Springs with firm banks will be abundant, and the water-courses will be clear and steady. On mountains exposed to the trade-winds rains may be excessive, but this is not a disadvantage where the drainage is good.

A poorly endowed region will have : The trade-winds retarded or shut out by overhanging mountains, which, when facing the sea, will tend to cause the formation of zones of atmospheric stagnation. Low narrow valleys, isolated from the trade-winds, and not favorably situated for the development of regular local air currents. The drainage will be retarded by surface elevations or underlying strata, and floods, stagnant pools and seasonal swamps will develop. Where rains are excessive these disadvantages become assuredly fatal, and under any conditions the region had better be avoided.

FRANCIS C. NICHOLAS.

NEW YORK, January 20th, 1897.

WASHINGTON LETTER.

WASHINGTON, MARCH 20, 1897.

FOREST RESERVATIONS.—On the 165th anniversary of the birth of Washington (February 22, 1897), President Cleveland, under the authority of the Act of March 3, 1891, proclaimed 13 forest reservations having an aggregate area of about 21,000,000 acres. These reservations are situated within the States of Washington, California, Idaho, Montana, Utah, Wyoming, and South Dakota. This action was taken upon the recommendation, approved by the Secretary of the Interior, of a Committee of the National Academy of Sciences. This Committee was appointed at the instance of the Secretary and consisted of Prof. Charles S. Sargent, Director of the Arnold Arboretum at Harvard University; Gen. Henry L. Abbott, United States Engineer Corps; Prof. Wm. H. Brewer, of Yale University; Mr. Arnold Hague, of the United States Geological Survey; Mr. Alexander Agassiz, and Mr. Gifford Pinchot; the president of the National Academy, Prof. Wolcott Gibbs, being *ex-officio* a member. This commission began its work on July 2, 1896, and spent about three months of travel and study, without compensation, in the examination of the public forests of the country, in order to render opinions upon questions asked by the Secretary of the Interior, as noted in the BULLETIN, Vol. XXVIII, p. 180. Their recommendations to the Secretary of the Interior made on February 1, 1897, were promptly followed by this action of the President.

The publication of the proclamation was followed by energetic protests by the senators and representatives from the States in which these reservations are located. They insisted that such wholesale withdrawals of the public lands was a step of too great public importance to be taken without general notice, and especially without consultation with themselves as representatives of the West. They urged that such action should not have been taken until a code of laws governing forest reservations had been prepared and put into operation, and that great injury was done to the development of their States by thus removing at once large areas from which timber is being taken and upon which there may be discovered deposits of mineral wealth.

An attempt was made to nullify the President's action by insert-

ing in the Sundry Civil Bill a clause restoring these recent reservations to entry and settlement under the public land laws as if the Executive proclamation had not been made. This amendment was not concurred in by the House of Representatives, and the suggestion was made that instead of invalidating the Executive order steps should be taken at once to provide suitable legislation for the proper use of the reservations, the cutting of timber, the prospecting for minerals, and the rectifying of the boundaries by which agricultural and other land valuable for other purposes than tree growth might be excluded.

Attention was called to the fact that bills for this purpose had already passed the House and one of these had been favorably considered by the Senate at a previous session. It was urged that a backward step should not be taken, but rather that the legislation asked for during the past quarter of a century by various Commissioners of the General Land Office, and by Secretaries of the Interior, be at length enacted, having been thoroughly discussed in both House and Senate. In the final agreement, however, between the conferees of both houses, the matter was stricken out, leaving the subject of forest reservations as one of the first items of general importance to be taken up by the 55th Congress.

The conditions as they now exist are intolerable. The existing forest reservations, with those proclaimed by President Harrison, aggregate an area of over 38,000,000 acres, including within their borders some of the most valuable timber lands belonging to the Government. The proclamation removes the land upon which title has not already been acquired from the list of vacant areas, not permitting timber to be cut, nor mining to be carried on, nor any use or occupancy of the ground whatever. By lack of legislation, however, no protection is afforded; fires may start and sweep over vast areas, destroying the timber, and no finger can be raised to prevent its spread; the settler may need timber for his home or fence posts, but he cannot legally touch a stick, although there may be none other to be had within a thousand miles; valuable mines employing large bodies of men may be within or adjacent to the reservations, and not a mining prop nor piece of firewood can lawfully be used. The farmer, the miner, and in fact every citizen living within or near a forest reservation, is forced by necessity to become a law-breaker, either directly or indirectly.

With the recent great extension of the forest reserves, one of two things must probably happen: either the whole idea must be abandoned and the reservations restored to the vacant public

domain, or Congress must provide laws by which suitable rules and regulations can be promulgated for the proper utilization of the resources contained within these areas.

The following table shows the relative extent of these forest reservations by political divisions. In the column next to that giving the name of the State or Territory is the aggregate area, and to the right of this is the percentage which this bears to the whole area of the State or Territory. By examining this, it is to be noted that the largest percentage (18.94) is in Washington, where the forest reservations include over one-sixth of the land surface of the State. In most of the other States the reserved areas are from about 2 to 7 per cent. In the next column to the right is shown the relation which the reserved area bears to the total extent of vacant public land in each State. In Washington the reservations include nearly one-third of the whole area of land otherwise open to entry and settlement, and in Oregon and California over one-tenth of the vacant land; in the other States the ratio is less than 8 per cent. In the column at the extreme right a comparison is made between the estimated area of forest and woodland and the amount reserved. In South Dakota practically all of the wooded area of the State has been covered; in Washington one-fourth; in Wyoming less than a fifth, and in California, Montana, Oregon and Colorado from 12 to 15 per cent.

EXTENT OF FOREST RESERVATIONS.

STATE OR TERRITORY.	AREA IN ACRES.	PER CENT. OF WHOLE.	PER CENT. OF AREA VACANT.	PER CENT. OF FOREST AND WOODLAND.
Arizona	1,851,520	2.56	2.67	9.90
California	6,867,200	6.87	10.76	15.26
Colorado	3,103,360	4.67	6.58	12.61
Idaho	4,008,960	7.43	7.96	12.37
Montana	4,999,680	5.37	6.04	14.04
New Mexico	311,040	0.40	0.52	0.96
Oregon	4,653,440	7.68	10.80	12.57
South Dakota	967,680	1.96	3.66	96.76
Utah	875,520	1.66	1.83	3.94
Washington	8,110,080	18.94	31.10	25.00
Wyoming	3,196,160	5.11	5.44	18.26

From an examination of the above table it is seen that the forest reservations, although not relatively large, are important, and are

worthy of careful consideration. Although their area, in comparison with the total amount of forest and woodland, is in many cases small, yet the fact should be borne in mind that they include some of the most important timber lands and have been selected with especial reference to beneficial influence upon the water supply of the country.

ARIZONA.—The results of recent surveys by Mr. Arthur P. Davis in southern Arizona, along the Gila River and in the vicinity of Superstition Mountains, have been made public in a Senate document (54th Cong., 2d Session, Sen. Doc. No. 27). This survey and examination was undertaken for the purpose, primarily, of ascertaining the available sources of water supply for the Pima and Maricopa Indians, living upon the reservation near the junction of the Gila and Salt rivers. A thorough exploration was made for reservoir sites, and two of these were carefully surveyed. At the same time detailed topographic maps were made of portions of the catchment basins and of the areas over which some of the possible canal lines might be built.

The Indians upon this reservation, numbering about 5,000, have always been friendly to the whites, welcoming them in the pioneer days and joining with them in repelling the attacks of the Apaches—the scourge of this southwestern country. In those early days there was ample water supply and the plains Indians cultivated by irrigation small farms along the rivers, and later sold grain and hay to the Government and to the overland emigrants. As the opportunities for hunting were reduced by the increase of the whites and by restriction to the reservation limits, more and more attention was given to agriculture, the tribes being wholly self-supporting. Agriculture on the reservation, however, is only possible by the employment of water from the Gila River. This water supply the Government has allowed to be diminished, and finally almost entirely taken away, by disposing of the fertile desert lands higher up—areas which also are dependent for their value upon the waters of the streams. Thus, while one Bureau has been endeavoring to educate and to improve the condition of the tribes, another Bureau has, through its operations, brought them down from self-supporting farmers almost to the condition of paupers, dependent for their food upon the issue of rations.

The investigation made by Mr. Davis shows that flood waters may be impounded at several localities and brought to the reservation at moderate cost per acre of land benefited. It is also shown

that there is probably underground a sufficient supply, and that this can be pumped to the surface, although the cost per acre would be largely in excess of that from the stored water. The survey brings out clearly the fact that the development of the fertile, semi-tropic lands of southern Arizona is dependent upon the storage of water in the various localities, suitable for the construction of reservoirs.

FLORIDA.—The recent exploration conducted by Mr. Frank Hamilton Cushing on the west coast of southern Florida, in the vicinity of Ten Thousand Islands, have yielded results of considerable geographical interest. The work has been conducted under the joint auspices of the Bureau of American Anthropology and of the American Archeological Institute. Mr. Cushing was accompanied in his work by Mr. Wells M. Sawyer, as artist. A general exploration of the islands and reefs in the vicinity was made and over a hundred mounds were examined and mapped in part. These mounds, built to heights of 60 feet and upwards, were found to have a more or less rectangular outline, and in general were in the form of flat-topped pyramids. They are surrounded by terraces or broad benches, and from them lead long roadways which are extended out into the water by parallel lines or banks of narrow canals. All of these artificial works are thickly covered with large conch-shells, some of these still remaining in position in nearly vertical walls, those of uniform size having been carefully selected and placed in parallel rows. The causeways, or roads, leading up to the mounds were found by excavation in places to have been made of huge clam-shells laid with the convex surface up, forming thus what would at first appear to be a cobblestone pavement.

Excavations in the marshes were conducted with the result of finding in one locality a particularly fine collection of implements and household ware, all made of wood, bone or shell. Only one or two pieces of stone were found, the principal one of these being a very carefully wrought ear ornament, or hanger. The most noticeable objects were the ceremonial masks carved in imitation of the human face and of the heads of animals. On these there is yet to be seen the traces of paints of various colors. Fragments of war clubs and spears were also obtained, these showing plainly that they had once been armed with sharks' teeth, firmly held in place by thongs, or leather cords. Saws, or implements for cutting the shells, were also discovered, these consisting of a wooden strip in which sharks' teeth were used for the cutting edge.

A study of the conditions under which these fragments were found indicates that they are undoubtedly pre-Columbian and possibly of even far greater antiquity, since there must have been considerable changes in the coast line and a union of outlying islands with the main land. The character of the ornamentation indicates also that the people who dwelt on these islands were closely allied to the natives of the northern part of the Continent of South America, and to those of Yucatan. Certain devices also are similar to those upon ornaments found in mounds in Georgia. One apparently significant fact is that although spears and throwing-sticks were found, there is nothing to indicate that these people used the bow and arrow. The mounds were probably occupied by the temples or public buildings of the tribe, while the houses were possibly constructed upon piles over the water or marsh land, the causeways apparently connecting these groups of buildings.

EXPLORATIONS IN BABYLONIA.—Dr. John H. Haynes, the Director in Charge of the recent explorations in the vicinity of Bagdad, has returned to Washington, where he is preparing for publication the narrative of his work, carried on under the auspices of the University of Pennsylvania. This expedition is the third of a series, the first being conducted in the winter of 1888–89 under the direction of Rev. Dr. John P. Peters. With him were associated Dr. H. V. Hilprecht, Dr. R. F. Harper, Dr. J. H. Haynes and others, the principal results being the survey of the ruins of Nippur and surrounding areas, and the examination of special points by means of trial trenches. The second campaign, that of 1889–90, was also under the direction of Dr. J. P. Peters. In this the examination of the ruins was continued by means of trenches. About 8,000 cuneiform tablets and fragments, besides numerous inscribed pieces of vases and other objects, were brought away. The third, or recent campaign, is the most notable, extending from April, 1893, to February, 1896, being interrupted only during the months of April and May, 1894. Systematic excavations were made, using a force of, on an average, from 50 to 60 Arabs. An examination was made of the lowest strata of the Temple at Nippur, the vast ruins of the Temple of Bel and other buildings being systematically uncovered, measured, photographed and mapped.

The extraordinary energy, perseverance and devotion of Dr. Haynes are shown by the large amount of work accomplished in the face of almost insurmountable difficulties. From a geographical standpoint one of the most important results has been the

demonstration that it is practicable for a European to reside and work throughout the summer in this country, which resembles in many ways the deserts of the southwestern part of the United States. The comparison is further strengthened by the existence there of the most treacherous and brutal of the Arabs, comparable to the Apaches, who within comparatively few years swept down from their mountain homes upon the traveller crossing the southern deserts. In spite of the extreme heat, reaching at times 120 degrees F. in the shade, Dr. Haynes continued his work, living within a small fortified camp and being for the greater part of the time without a single trustworthy companion other than his Turkish Commissioner. His position was rendered especially precarious toward the last by the rising wave of religious fanaticism, traversing the Turkish Empire, intensifying the belief, lurking in the minds of even his own laborers, that no higher service could be rendered the Deity than by killing the only infidel Christian within reach. His final journey out of the country from Bagdad east to the Mediterranean was one full of danger, on account of the excited and restless religious fervor of the Mohammedan tribes.

The innumerable ruins in this country, some of them dating more than 4,000 years B. C., testify to the extraordinary fertility of this valley, the "Garden of Eden," under irrigation, and illustrate what may be accomplished in the southwestern parts of our own country near Colorado River, where the climate and soil are similar. At the same time the deserted character of the country testifies to the ruin and desolation wrought by bad government and maladministration of the water system—the life blood of the country. In one case it is reported that the ruins of a modern town were crossed, and on inquiry it was learned that until recently this had been a fairly prosperous village, but that the water taxes had been steadily increased and finally doubled, so that the inhabitants could no longer pay them. The Turkish Government accordingly, not being able to obtain the desired sums, cut off the water supply, and as a result the inhabitants either starved or joined the wandering bands which infest the country. N.

RECORD OF GEOGRAPHICAL PROGRESS.

NORTH AMERICA.

MR. MORRIS K. JESUP'S EXPEDITION.—Mr. Morris K. Jesup, president of the American Museum of Natural History, has generously provided the funds for an important work which the Museum is about to undertake. A systematic exploration and study will be made of the peoples inhabiting the coasts of the North Pacific Ocean, between the Columbia River in America and the Amur River in Asia. The explorations along these extensive coasts are expected to cover a period of six years. The first party will start for Washington and British Columbia this spring, and Dr. Franz Boas will be one of its three or four members. It is the purpose, if possible, to clear up many of the obscure points regarding the early history of the American race. The important question of the relation of the American race to the races of the Old World has long been discussed, but has never been studied in a systematic manner. Some investigators believe that American culture grew up spontaneously, while others think they have found traces of Asiatic culture on this continent. It has been suggested that Asiatic influences may have reached America by two routes, *via* Bering Strait or by the islands of the Pacific to South America. Mr. Jesup's expeditions will endeavor thoroughly to investigate the hypothesis, favored in recent writings by Dr. Ratzel, Dr. Boas and Mr. Otis T. Mason, that an early interchange of cultural achievements took place between northeastern Asia and western America. This theory is combated by some, notably by Mr. D. G. Brinton. The racial relationship between the peoples of Asia and America is also a controverted question. Dr. Boas is quoted in the *Evening Post* as saying: "When I expressed the opinion that the peoples of British Columbia are more closely related to the Asiatic race than any other North American Indians, I did not bring forward any material from the Asiatic side to sustain the assertion." The solution of these questions requires a systematic study of the whole area, and it is important to take up the work before civilization has destroyed the primitive cultures entirely.

Dr. Boas adds that the only contribution to our knowledge of the ethnology of the Pacific coast of Siberia of any great scientific value is that of Schrenck on the peoples of the Amur. But not-

withstanding this and other work, the types of man, the languages, customs and mythology of the whole region are practically unknown. Information is somewhat fuller on the American side, and includes for Southern Alaska and the Aleutian Islands the linguistic works of the Russian missionary, Veniaminoff, and the researches of Dall, Pinart, Krause and Emmons; for Arctic Alaska, mainly the work of Murdoch on the Eskimo of Point Barrow; for British Columbia, the investigations under the auspices of the British Association, mainly by Dr. Boas. The Pacific coast work will be begun this spring in fields still unexplored, and will be continued as long as there are important gaps in our knowledge of the ethnology of the coast. A thorough study of all the numerous dialects, of the customs of all the tribes, and of the physical characteristics will be required to bring order out of chaos. The problems to be studied offer many difficulties. Between the Columbia River and Bering Strait, for instance, ten languages are found that are fundamentally distinct, and these languages have thirty-seven dialects that are mutually unintelligible. On the Asiatic side there are seven distinct languages spoken in at least ten dialects, which are mutually unintelligible, but there may be more, since our knowledge of the whole area is very meagre.

Dr. Carl Lumholtz in Mexico.—The *Mexican Herald*, City of Mexico, of Dec. 25 last, has an interview with Dr. Lumholtz, who was paying a short visit to that city. He is reported to have said that since his return to the Sierra Madre Mountains, about two and a half years ago, on his second expedition, he worked southward among the mountains through the States of Chihuahua and Durango among the Tarahumari and the Tepehuane Indians, the former living in the south part of Chihuahua and the latter in Durango. He lived a year and a half among these tribes and then spent a half year among the isolated Huichole Indians, who number about 4,000, and are walled in among the mountains of the State of Jalisco. He has also spent some time among the superstitious and rather unfriendly Tarascan Indians of Michoacan. In the five years of his work in Mexico he has lived among ten tribes. He was about to go to Guadalajara and Chihuahua for some further material, and expected to publish a book entitled "Five Years among the Indians in the Sierra Madre." Among his large collections are nearly 2,000 photographs of the natives, their arts, customs, etc.

Unexplored Territory North of Cook's Inlet.—The United States Geological Survey contemplates sending a party into the region north of Cook's Inlet, Alaska, this season, to make a survey and map of that little known region which is beginning to attract the attention of gold-seekers. Last summer a party of prospectors ascended the large and rapid Sushitna River, which empties into Cook's Inlet, to some large falls which they discovered, about 250 miles from the mouth of the river. One of them, Mr. W. A. Dickey, of Seattle, wrote an account of the journey which bore evidences of careful and conscientious preparation. He reported two very interesting discoveries. One was that there is a break, at least 150 to 200 miles long, in the range of the Alaska Mountains, the continuation of the Rocky Mountains. This range has been shown for years on our maps in unbroken continuity extending to the sea and then far out into the ocean as the Alaska Peninsula. But Mr. Dickey reports that for 150 to 200 miles inland from Mount Sushitna on Cook's Inlet, there are no mountains where the Alaska Range has appeared on the maps. On the contrary, a broad, level country, heavily timbered with spruce and birch, stretches to the westward as far as can be seen from points on the low mountains east of the river. The other discovery was a towering mountain north of the break in the Alaska Range. It was much higher than any of the surrounding peaks and some members of the party estimated its height at 20,000 feet, which may easily be an exaggeration.

The Origin of Crater Lake.—Mr. J. S. Diller, of the Geological Survey, who, last year, studied the neighborhood of Crater Lake, in the Cascade Range, South Oregon, describes (*Amer. Jour. of Sci.*, March, 1897) the geology of that region and discusses the origin of this most remarkable lake in North America. The lake is deeply set in the summit of the Cascade Range, which at this point is broad, with gentle slopes, cut by cañons, and surmounted by numerous volcanic cones. The rim of the lake, which is nearly circular, with an average diameter of six miles, rises 1,000 feet above the general level of the range. The greatest feature is the enormous pit, or caldera, containing the lake. It is 4,000 feet deep, extending from the crest of the Cascade Range half way down to the sea-level. The pit is half concealed by the waters of the lake and its volume is nearly a dozen cubic miles. The history of the lake and its rim began in the upbuilding by normal, volcanic processes of a large volcano, Mount Mazama (thus christened last summer by a society of mountain-climbers of Portland, Oregon).

This mountain was comparable, in the nature of its lavas, structure and size, with the greater peaks of the range. Crater Lake did not then exist, but its site was occupied by this active volcano, down whose higher slopes glaciers descended, scratching the rocks and depositing moraines about its base. Later eruptions occurred in the glacial period, and then, the molten material of the interior withdrawing, the summit of Mount Mazama caved in, giving rise to a caldera nearly six miles in diameter and 4,000 feet deep. Thus originated the great pit in which Crater Lake is contained, encircled by a glaciated rim, the hollow base of the engulfed Mount Mazama. Volcanic activity continued upon the bottom of the caldera and the pit was partly refilled by cinder cones and lava fields. Then volcanic activity ceasing, and precipitation being greater than evaporation in that region, the conditions were favorable for water accumulation and Crater Lake was formed in the pit.

Recent Elevation of the Southern Coast of Baffin Land.—Mr. Thomas L. Watson, a member of the Cornell Greenland party of the sixth Peary expedition, last summer, had an opportunity to study the coast of Baffin Land, where four stops were made, viz., at Big Island, the mainland just north of Big Island, Icy Cove on Meta Incognita, and Niantilik Harbor in Cumberland Sound. He contributes to the *Journal of Geology* (Vol. v, No. 1), a paper giving the evidence in favor of the recent elevation from 270 to 300 feet above present sea-level of the lands along the south and southeast coasts of Baffin Land. This evidence is in the form of raised beaches; unlike surface conditions with differences in degree of weathering; the remains of genera and species of living shells on the beaches; beaches in many fiordic valleys on Big Island and in Cumberland Sound, now five to ten feet above high tide, but so recently formed that no vegetation has begun to grow. The uplift along South Baffin Land appears to be co-extensive with that described by Bell and Tyrrell in the Hudson Bay region.

SOUTH AMERICA.

The Patagonian Andes.—Dr. Hans Steffen, in an interesting article on the Patagonian Andes (*Scot. Geog. Mag.*, Feb., 1897), says that a long series of hydrographic questions still awaits solution in these cordilleras. A peculiarity of this region is that the sources of most of the large rivers flowing into the Pacific Ocean extend through the ranges to the eastern offshoots of the mountains. The mouths and lower courses of the rivers have long been known,

but it is very difficult to explore the middle and upper courses from the west side, owing to the forests and the rugged character of the country. On the Argentine side, however, the upper courses of the rivers flowing to the Atlantic may be followed on horseback until they enter narrow gorges towards the west, where steep banks and rapids often present insurmountable obstacles. Thus, the problem of the Rio Palena, emptying into the Pacific, on which an official Chilian expedition worked from December, 1893, to March, 1894, is not yet fully solved, it being uncertain whether the Rio Frio, one of the sources forming the Palena, is identical with the Staleufu, or whether the latter belongs to another hydrographic basin. It is easy to understand, from Dr. Steffen's paper, why the decision of the Commission, as to the boundary between Chili and Argentina, among these cordilleras, has been awaited with such great interest. Between the water-parting, from which the rivers flow to the Atlantic and Pacific, and the central, snow-covered mass of mountains, are large valleys of great agricultural value. Argentine colonists are settling in them. Farmers and herders, for instance, are moving into the Valle del Diez i Seis de Octubre, which is easily reached from the Argentine Pampas by broad passes. The valley is over 2,000 feet above sea-level, is abundantly watered, has a mild climate, fine pasture lands, and derives additional value from the discovery of auriferous deposits near at hand. While Argentina has been settling these valleys, Chili has been upholding her claim to them, for they all lie to the west of the ranges that form the water-parting.

AFRICA.

Ascending Mount Kenia.—Mr. George Kolb reached the summit plateau of Mount Kenia late in 1895. The exact date of his ascent is not given in the account printed in *Petermanns Mitteilungen*, October, 1896. He attempted the snow mountain, which lies under the Equator in East Africa, and is supposed to be the second loftiest summit of that continent, on the east side, and was over five days reaching the plateau, which, he says, is 18,600 feet above the sea. When he began the ascent he was about 6,000 feet above the sea, and his total climb was about 12,600 feet. On the third day of the ascent, above the tropical zone, he reached Lake Ntorobbo, about two miles long and a mile and a quarter wide, over whose surface a skimming of ice forms nearly every night. Only ten of his party of natives remained with him till he reached the summit plateau, which he describes as about twelve miles long from north to south

and five miles wide. Victoria Peak (so called by Kolb, but known to the natives as Kilimara), the ice-crowned pinnacle of Kenia, is near the west edge of the plateau, and rises about 400 feet above it. It has been seen and described by climbers who attempted to reach the summit from the west side.

The somewhat undulating surface of the plateau has a scanty covering of moss and other sub-Arctic vegetation, and in some of the depressions ice was found. During the night, some of the party were frost-bitten, the blue and feeble flame of the fire emitted little warmth, a light snow fell, and at midnight there was twelve degrees of frost. The last of the food supply was consumed at the evening meal, but, nevertheless, Mr. Kolb and four of the men, next morning, advanced some distance towards Victoria Peak. They soon turned back, however, owing to the necessity of procuring food among the natives far down the mountain. Mr. Kolb thinks Victoria Peak can be climbed, though with some difficulty, as it rises from a narrow base and has a steep slope.

Kenia was discovered by the missionary Krapf on December 3, 1849, and he saw it again two years later. Joseph Thomson, who saw the mountain from the west side in 1883, was prevented by the hostility of the natives from getting nearer than twenty-five miles from its base. Count Teleki, in 1887, starting from its western base, attained a height of 15,350 feet. Capt. Dundas, in 1891, attempted the ascent from the east side, but reached a height of only 8,700 feet above the sea. Dr. Gregory, in 1893, ascended the western slope to a height of about 17,000 feet, from which point he saw descending glaciers that formerly had extended much further down the mountain. He says Victoria Peak is the core of a greatly denuded old volcano, whose crater long since disappeared. Mr. Kolb says the mountain is not difficult of ascent on the east side. Kenia is a volcanic mass, nearly 30 miles in its longer diameter at its base. The third largest of the known snow mountains of Equatorial Africa is Mount Ruwenzori, which has not yet been ascended to the top, though Mr. Scott Elliot (1894) reached a height of 12,640 feet. He thinks a practical mountaineer could manage the ascent. He believes he saw no peak in the Ruwenzori region that was higher than 16,500 feet.

EXPLORERS IN THE MAROTSE AND MASHIKOLUMBWE COUNTRIES.—Two officers in the British army, Capt. Gibbons and Capt. Bertrand, and Mr. Percy C. Reid, did some creditable geographical work in 1895–6 in that part of the Marotse and Mashikolumbwe countries,

bounded on the south and west by the Zambesi and on the east by the Kafukwe River. The three men crossed this country by different tracks, and their combined information and surveys have enabled Mr. Ravenstein to produce, in *The Geographical Journal*, a map giving a trustworthy delineation of its main features. Capt. Gibbons made extensive journeys along the Zambesi from the Victoria Falls to Lialui, the residence of the famous King Lewanika, and then far east between the northern and southern parts of the country, into the land of the Mashikolumbwe, checking his routes by numerous observations for latitude. Mr. Reid made a survey of the Machili River, determining the latitude of fourteen places; and Capt. Bertrand, from the head of that river to Lialui, connected the routes of his fellow-travellers and filled up a vacant place on the map, which certainly shows the advantage of several competent men working in co-operation. The altitudes seem to show that no part of the region visited has an elevation of less than 3,000 feet, and Mr. Ravenstein expresses the view that Lake Ngami will be found to lie at that level, though Mr. Chapman placed it at only 2,260 feet above the sea. The thermometer, at 6 A.M., one day in August, registered as low as zero, which is remarkable at so low a latitude and at an elevation of only a little over 3,000 feet.

Districts in Tropical Africa where White Men may Live and Work.—Tropical Africa, having been explored in broad outline, one of the interesting questions now being studied relates to the regions where the enterprises of white men may be carried on under fairly favorable conditions. Capt. B. L. Schlater, who is building a road through the British East Africa Protectorate to Victoria Nyanza, in advance of the railroad now constructing, speaks of the floor of the great Rift Valley, the longitudinal depression dividing the Mount Kenia uplands from the Mau and other plateaus to the west, as most excellent grazing ground, and he believes ranching may successfully be carried on there. The Mau and Nandi plateaus enjoy a perfect climate, and malaria is unknown above 7,000 feet. They are watered by numerous, perennial streams in deep wooded valleys. In Nandi, the cattle and sheep are the finest in East Africa. Sir John Kirk maintained (Sixth International Geog. Cong., London, 1895) that "we may dismiss as useless, for the purpose of real colonization, the whole of the maritime zones on both coasts of Africa, together with all lands in Tropical Africa below a general level of 5,000 feet."

EPHEMERAL LAKES.—Mr. Clifford H. Craufurd's journeys up the Jub River, East Africa (*Geog. Jour.*, Jan., 1897), give further evidence of the transitory character of a considerable number of African lakes. Three years ago, Deshek (lake) Ria Ghata was reported west of the lower Jub, and also Deshek Wayu, about four hours further north. When Mr. Craufurd sought them later he found merely dry depressions, that of Deshek Ria Ghata being about five miles long and 900 feet wide.

LAKE KIVU AND THE RUSIZI RIVER.—*Le Mouvement Géographique* prints (Feb. 21, 1897) a sketch map of Kivu, the considerable lake first seen by Count von Götzen (1894), north of Tanganyika, to which its waters are carried by the Rusizi. Livingstone supposed this river carried Tanganyika's waters to the Nile and was much surprised, when he visited its mouth with Stanley (Nov., 1871), to find that it was an affluent, not an effluent of the lake. The Congo State has now ascertained the limits of the Kivu Basin, which is separated from the Nile Basin by the volcanic Virunga Mountains on the north, and has planted two stations on the east shore of the lake. The details of the explorations of Kivu and Rusizi are not yet at hand, but it is known that a succession of falls renders the Rusizi unnavigable. The elevation of Kivu above Tanganyika is given at about 2,300 feet, and its absolute elevation at about 4,900 feet, which makes it the most elevated lake yet found in Africa except Tana, in Abyssinia, which is about 5,740 feet above sea-level.

FIRST COMPLETE DESCENT OF THE NIGER.—M. Hourst, last year, wound up the century's record of exploration in the Niger Basin, with the first complete descent of that river that has been made. He arrived at Akassa, in the Niger Delta, on Oct. 13, after a wholly peaceful voyage from Timbuktu, during which he collected the material for the first map, on a large scale, that has been made of the Niger. He mapped the long section from Timbuktu to Bussa on a scale of 1:50,000. The section from Timbuktu to Tibi Farca had never been explored.

NEW ROUTE TO LAKE TCHAD.—M. Gentil, in the French Congo service, started towards Lake Tchad from the Mobangi tributary of the Congo in November, 1895, with the small steamboat *Léon Blot*, which is divisible into sections for land transportation. Ascending the Kemo tributary of the Mobangi, he soon entered the Tomi affluent of the Kemo, an important water-course, over 300 feet wide

at high water, and navigable at all times by canoes as far north as Krebedge, in 5° 46′ N. lat., where Gentil founded a station. From that point he took the land route across the water-parting between the basins of the Congo and the Shari. His material, including the steamer, made about 1,000 loads for the carriers, a large part of which were borne on the shoulders of the natives of that region. In September last he reached the Nana River, of the Shari system, where he founded another station in 6° 46′ N. lat. The river is navigable, and six miles below the station is joined by the large Gribingui River. The land march between the stations was about 93 miles. When M. Gentil sent this news, on Oct. 12 last, he hoped, in November, to float his steamer again, and if all went well to reach Lake Tchad and navigate it by steamboat. If this route proves feasible a short, narrow-gauge railroad across the water-parting will establish communication by steam between Europe, the Central Sudan and Lake Tchad as soon as the Congo railroad is completed, which is a question of only a year or two more.—(*Le Mouvement Géographique*, No. 10, 1897.)

ASIA.

Population of the Chinese Empire.—Mr. P. C. Popof published in the *Izvestiya* of the Russian Geographical Society (No. 3, 1896), figures for the population of China in 1894, which he had obtained with the help of the Chinese Foreign Office. The total population for the twenty-two provinces is given as 428,908,206. Statistics were available for only fourteen provinces, the population of the remaining eight provinces being estimated on the basis of an increase of five per cent. in the twelve years ending in 1894, the rate at which, the Chinese say, the population increased in the provinces of China proper. These figures are not reliable, for China has no census worthy of the name, but they are interesting as the Chinese official estimate of the population of the empire. The estimate of the population of China proper in *Die Bevölkerung der Erde* (No. VIII, 1891) is 350,000,000; Manchuria, 7,000,000; inner Asian possessions of China, 4,500,000; total for the empire, 361,500,000.

Recent Journeys in Tibet.—Capt. Wellby and Lieut. Malcolm crossed northern Tibet between June 1 and Oct. 15, last year, keeping between 35° and 36° N. lat. most of the way, and nearly bisecting the largest unknown area now remaining in Tibet in the northwest part of that territory. The new country they traversed had little

fresh water, many salt lakes, and was so nearly destitute of grass that their mules and ponies rapidly died. The extremes of heat and cold in June and July were very great, the mercury marking 14° above zero (Fahr.) one night in June, and rising to 105° in the sun at mid-day. They carried on survey work with the plane-table, theodolite and sextant, recorded altitudes and temperatures and took photographs.

Capt. H. H. P. Deasy also travelled about 700 miles in this northwestern part of Tibet, between May 27 and Nov. 4, last year. Nearly due north of Aru Cho, a lake discovered by Bower, Capt. Deasy struck the barren and waterless country and, near its edge, great herds of antelope, not less than 15,000 being in view at one time. He did not venture into the waste region, but turned south through better known territory to 32° 35′ N. lat., 82° 40′ E. long. The heights and positions of 250 peaks were fixed trigonometrically, and many observations were taken for latitude, time and azimuth and to determine the compass variation. Cloudy weather prevented many observations for longitude.—(*The Geog. Jour.*, Feb., 1897.)

Borneo Crossed.—Dr. A. W. Nieuwenhuis, last year, crossed Borneo from west to east, ascending the Kapuas River to its headwaters and then crossing the water-parting to the Penane, by which he reached the Mahakkam River, which he followed to its mouth. His journey, therefore, involved very little land travel, as the two large rivers were utilized most of the way. When Mr. G. Muller ascended the Mahakkam in 1825 he was murdered and all his notes were lost.—(*Peterm. Mitt.*, Dec., 1896.)

Development of the Malay Peninsula.—The influence of proximity to a great ocean highway upon the development of oriental or uncivilized lands is illustrated by the Malay Peninsula. For ages the Straits of Malacca have been the path of intercourse between India and the far East. The west coast of the peninsula, fronting on the Straits, has accordingly been in constant touch with more highly developed peoples and has reached a comparatively advanced stage of civilization. The states of Perak, Selangor and the Negri Sambilan, long ago included in the British Protectorate, have railroads, churches and schools. All the other territories on the west coast are open to Western enterprise and are rapidly developing. The east coast states, however, being much less accessible to the trade sea routes, have not had the same rapid development.

The whole of the state of Trengganu and a large part of Kelantan remained unexplored until 1895. The first step towards opening up the east side of the peninsula was taken in 1888, when Pahang, the most southern state, was placed under British protection. A great deal of British capital is now invested in the gold and tin mines of that state, and trading vessels are plying regularly between the ports of Pahang and the more northeastern coast states.—(Mr. Hugh Clifford, in *The Geographical Journal*, Jan., 1897.)

AUSTRALASIA.

THE CALVERT EXPEDITION.—In May last year, Mr. Albert F. Calvert fitted out, at large expense, an expedition to explore the waste of West Australia. The party, under the leadership of L. A. Wells, with his cousin C. F. Wells as second in command, started from Cue, in the Murchison River district, in June last, and struck out to the north across the desert and through an area that had never been visited, between the east and west tracks of Giles (1876) and Warburton (1873), about 350 miles apart. Nothing was heard from the explorers until last December, when a cablegram from Australia, supplemented by a letter from Mr. Wells, showed that the party had suffered terrible hardships and two members had perhaps perished. The expedition nearly died from lack of water. The party succeeded, however, in traversing the desert to Warburton's route, making for the Joanna Springs, which he placed on his map at 20° 6′ S. lat. and 123° 56′ E. long. They could not find the Springs, and Mr. Wells wrote that their position must have been wrongly indicated. They were now in sad straits and were compelled to abandon all their collections, including 3,000 specimens of natural history, instruments, firearms, and five of their seventeen camels. Four buckets of water remained, and they pushed on over the desert to the north, for the Fitzroy River, still about 150 miles away, which they reached in a woful condition. While still about 360 miles from the Fitzroy, Mr. Wells had despatched his cousin and Mr. G. L. Jones, the geologist, on a flying trip, eighty miles to the west. They were not heard of again, and there is little hope that they are living unless they have met natives near the western edge of the desert. Mr. Wells proposed to return by way of Lake Amadeus, on the eastern border of the Colony, and then make for Mount Bates to the west, apparently along Forrest's route in 1874.

A JOURNEY ACROSS NEW GUINEA.—Sir William MacGregor, the Administer and indefatigable explorer of British New Guinea, has

made a journey across the wider part of the eastern peninsula. In a despatch printed in the Bristol (Eng.) *Telegraph* of Oct. 27, 1896, he says he travelled from the mouth of the Mambare River, on the north coast, to the mouth of the Vanapa, which empties into Redscar Bay, on the south coast. The Owen Stanley range is the water-parting between these river systems. He found miners at work at the foot of Mount Scratchley, probably the whole of which is auriferous.

THE ARCTIC REGIONS.

Glacial Observations in the Umanak District, Greenland.—In a paper read by Mr. George H. Barton at the Washington meeting of the Geological Society of America, he gave the results of the studies made last summer, by the party from the Massachusetts Institute of Technology, in and about Umanak Fiord. Greater Karajak and Itivdliarsuk were the important glaciers studied. Greater Karajak is five miles wide and over ten miles long from the inland ice to its frontal face. The crevassing of its current extends back several miles into the inland ice. Its surface is 1,500 feet above sea-level at the inland ice, and at its frontal face, 500 feet above sea-level, a gradient of about 100 feet to the mile. The rate of motion, observed during thirteen days, was $2\frac{1}{2}$ feet a day, at a distance of 3,396 feet from the side of the glacier, and at $2\frac{2}{5}$ miles out on the glacier, the rate was about 19 feet a day; while at 1,708 feet from the side, the ice was stationary, and near the shore was moving slightly up stream. With two exceptions, all the glaciers show evidence of diminution in length and depth, and everywhere are proofs of the former greater extension of the inland ice, which once covered all the higher peaks, filled the fiords and extended into Baffin Bay.—(*Jour. of Geol.*, Vol. v, No. 1.)

Mr. R. E. Peary's Expedition to Greenland in 1897.—A letter from Mr. Peary, read at the Washington meeting of the Geological Society of America in December, said that a ship would be sent to North Greenland, in the summer of 1897, to obtain the large meteorite on the coast of Melville Bay; and that the vessel would transport parties that might desire to study glacial and other natural phenomena. The Society endorsed his suggestion and recommended that colleges, universities and other scientific organizations consider the advisability of sending independent parties to be placed at various localities along the West Greenland coast to carry on work for five or six weeks. Mr. George H. Barton, of the

Massachusetts Institute of Technology, who accompanied the sixth Peary expedition to Umanak, has an article in *Science* (Feb. 19, 1897), describing the many advantages of this field of study, the excellent work that may be done at small cost, and the facilities for summer camping and transportation along the coast.

THE OCEANS.

Sub-Marine Investigations near Iceland.—The Danish warship *Ingolf*, which was engaged in hydrographic researches in the Danish waters of Greenland and Iceland for nearly four months, last summer, discovered a sub-marine, volcanic range extending for at least fifty miles into the Atlantic from Cape Reykjanes, the southwest promontory of Iceland. The summit of the range is only 200 to 300 feet below the surface. The *Ingolf* was able to approach only within 24 miles of Angmagsalik, one of the inhabited fiords of East Greenland, on account of the ice-pack, but the vessel reached Jan Mayen in the North.—(*Peterm. Mitt.*, Nov., 1896.)

Foundations of Coral Atolls.—Admiral Wharton has contributed to *Nature* (Feb. 25, 1897), a paper on some results of the recent surveys by H. M. S. *Penguin* among the islands of the Ellice group, one of the typical Pacific groups of atolls. He says the soundings carried on by the *Penguin* show incontestably that each atoll rests on a separate mound rising from a more or less even bottom of great depth below the surface, proving "that there has never been anything of the nature of a range of continental land which has gradually sunk beneath the waves. Each atoll, if it has sunk, has subsided independently with its own isolated volcanic peak." The *Penguin* also explored four neighboring banks, all of submerged atoll form, about 250 miles southwest of Ellice Islands. They are uniform in the depth of water (24 to 26 fathoms), over their areas, inside the low rim of growing coral encircling the edges. The largest bank is 22 miles by 10. Admiral Wharton does not believe the banks are due either to the uniform subsidence of mounds of the same height, or to the building up of mounds to the same level below the surface. He suggests that they are the result of the cutting down of volcanic islands by the action of the sea, and that this action has a considerable share in affording coral foundations. He mentions recently formed volcanic islands like Graham, near Sicily, and Falcon, near the Tonga group, to show that many of them are formed of loose matter, tufa, ash, etc., easily acted on by the waves, so that many such islands have disappeared or been reduced to a small part of their original area. He also

gives illustrations to show that volcanic ash may be moved, at depths of thirty fathoms or more, by waves, in an otherwise deep sea over which strong winds continually blow. The effect is to cut down an island to a considerable depth below the surface, the final result being a perfectly flat bank. He thus argues that without Darwin's theory of subsidence, deep and large atolls may be formed.

Surface Ocean Temperatures and Climate.—Mr. H. N. Dickson says (*Geog. Jour.*, Dec., 1896) that observations were taken, last year, in various parts of the North Atlantic, on currents and temperatures. About 1,000 samples of water were collected by the officers of a large number of vessels, and the work is to be continued this year. The purpose of this inquiry is to obtain a fairly complete knowledge of the surface currents in the North Atlantic and the Norwegian Sea and their bearing upon the distribution of the coast waters, and upon the interesting theory which Prof. Otto Pettersson has published in the *Meteorologische Zeitschrift* and which seems to be justified by all the facts now known. The data collected during a long period by Danish, Norwegian, Swedish and British observers, seem to show almost conclusively that when an unusual quantity of warm oceanic water has entered the Baltic in the autumn, cyclones with mild weather have marked the following winter; but when the land streams pour an unusually large quantity of cold fresh water into the sea, spreading it over the surface, cold, anti-cyclonic conditions are the result. The influx of a vast quantity of warm water in the Baltic, for instance, accompanied and was followed by the mild winter of 1894; but the southern part of that sea was entirely filled with fresh, cold water, mostly from the land, during the severely cold winter of 1895.

GENERAL.

President Jordan, in the Commission's report on the condition of the fur seal, estimates the number of seals killed last year at 440,000. About 27,000 pups died of starvation, and pelagic sealing caused the death of about 30,000. Since pelagic sealing began at least 400,000 females have been killed, which means the starving of 300,000 pups and the destruction of 400,000 pups unborn. In order to keep the Pribylov herd intact, he recommends that the open season for killing females be abolished.

The Twelfth German Geographical Congress, which will meet at Jena, April 21–23, will have for the chief subjects of discussion: 1, Report of the Special Committee, appointed in 1896, on Antarctic

exploration; 2, Polar exploration, North and South; 3, Geophysical questions (earth magnetism, gravity measurements, earthquakes, etc.); 4, Biological Geography; 5, Geography of Thuringia; 6, Geography teaching.

The *Scottish Geographical Magazine* quotes from *Ciel et Terre* the following heights of clouds obtained by Dr. E. Kayser from about 1,500 measurements by photogrammeter: stratus, 5,590 feet; strato-cumulus, 7,205; cumulus, 9,370; alto-cumulus, 13,445; cirro-cumulus, 21,437; cirrus, 32,949.

The latest census gives Greece a population of 2,418,000, an increase of 201,000 since 1889. Athens has 128,000 inhabitants.

On Feb. 3 Dr. F. Nansen addressed the Royal Geographical Society in Albert Hall, London, on which occasion a special gold medal was presented to him and special silver medals to Captain Sverdrup, Lieuts. Scott-Hansen and Johannsen and Dr. Blessing. Bronze medals were given to the other members of the *Fram* expedition.

The name of the Geographical Club of Philadelphia has been changed to the Geographical Society of Philadelphia. The membership has increased from 132 to 310 since 1892. In February, last year, the Society had the misfortune to lose its library and exchange files by fire. New quarters have been secured at 1520 Chestnut street, where the nucleus of the new library is collecting. The Society has seven regular meetings during the winter, besides occasional extra meetings, and is stimulating considerable local interest in Geography. Volume I of the Society's *Bulletin* was completed some time ago, and the first two numbers of Vol. II have been issued.

On July 6 and Sept. 8, last year, earthquakes in Japan were recorded by Dr. John Milne's seismographs, in the Isle of Wight, about sixteen minutes after their occurrence. Recent newspaper reports of disasters of this kind in Japan appeared, from the absence of records by the Isle of White seismographs, to have been exaggerated, and this proved to be the case. Dr. Milne has written to the London *Times* that a leading object now before seismologists "is to determine the velocity with which motion is propagated from an origin through the earth to its antipodes, and to other points upon its surface." In other words, it is desired to make a seismic survey of the world. He says that the sum of $5,000 would equip with the necessary instruments twenty Observatories that are willing to co-operate, and he trusts that this small sum may be raised to carry out so useful a work.

MAP NOTICES.

BY

HENRY GANNETT.

Atlas of United States.

Since the issuance of the last BULLETIN the U. S. Geological Survey has issued seventeen sheets of the United States Atlas. These are as follows: in western Maine there are three, Sebago, Norway and Bridgton, representing a region of glacial hills and lakes. The relief is strong, rising in the Saddleback Hills to 1,400 feet above sea-level.

In Vermont and eastern New York are four sheets: Equinox, in the Green Mountains, which rise here in Equinox Mountain to 3,816 feet; Stratford, in the eastern part of Vermont, and Castleton and Hoosick Falls sheets, in the broken hill country about the borders of the two States.

In New York is one sheet only, Lake Placid, in the Adirondacks. It includes the Lake Placid and much of the Ausable country, Wilmington Notch and Mt. Whiteface.

In western Texas there are seven sheets, all on the two-mile scale. They represent about 5,500 square miles of that strange Trans-Pecos region, a region of broad, level, arid valleys, separated by irregular trachyte mountains, volcanic outflows, greatly eroded. These sheets bear names: Valentine, Chispa, San Carlos, Ruidoso, Fort Davis, Eagle Mountain and Shafter. In all this region there is scarcely a flowing stream, except the Rio Grande.

In Colorado there is one sheet—Rico—representing on the mile scale the western slope of the San Juan Mountains, and including the mining district of Rico.

In western Oregon is one sheet—Roseburg—scale 1:125,000. This represents a broken country, drained by Umpqua River, and forming part of the great general depression between the Cascade Range and Sierra Nevada on the east and the Coast Ranges on the west.

During the past year the General Land Office has published a new edition of its general map of the United States. On this edition have been printed the boundaries of the original territory of the United States and the several accessions of territory. We

regret to see here a repetition of the old error of including Oregon in the Louisiana purchase.

This office has published also the following State maps:

Montana..... Scale 12 miles to one inch.
New Mexico.....Scale 12 miles to one inch.
Louisiana.....Scale 12 miles to one inch.
Arkansas .....Scale 10 miles to one inch.

During the year 1896 the United States Coast and Geodetic Survey has published and republished a great many charts. Among the new publications a large proportion relate to Alaskan coasts. We note among them many upon large scales, published by photolithography. We note also the increasing use of contours for expressing relief in place of hachures. The principal of their publications are the following:

Boston Harbor, Massachusetts. New chart from re-survey. Scale 1:20,000, in contours of 20 feet. Photolithograph; price 50 cents.—Kennebec River, Maine, from re-survey; published in three sheets. Scale 1:10,000. Photolithograph; price 50 cents each.—Coast Chart No. 114, Newport, R. I., to Plum Island, including Block Island Sound. A new chart on scale 1:80,000, relief by contours of 20 feet. Price 50 cents.—East River, New York, from Throg Neck to Randall's Island. Scale 1:10,000. Photolithograph; price 50 cents.—Harbor Charts, Santa Barbara Islands, California.—Anacapa Island and east end of Santa Cruz Island. Scale 1:30,000.—Prisoners' Harbor, Santa Cruz Island. Scale 1:20,000.—Southeast Anchorage, San Clemente Island. Scale 1:30,000.—Cutler Harbor, San Clemente Island. Scale 1:20,000.—Northwest Harbor, San Clemente Island. Scale 1:20,000. Relief is expressed by hachures; photolithograph, price 25 cents.—Noyo Anchorage and Approaches. Scale 1:10,000. Relief is expressed by contours; photolithograph; price 50 cents.—Santa Monica Bay, California. Scale 1:40,000; relief expressed by contours; price 25 cents.—Coquille River Entrance, Oregon. Scale 1:10,000; photolithograph; price 25 cents.—Umpqua River Entrance, Oregon. Scale 1:20,000; relief expressed by contours; photolithograph; price 20 cents.—Northwest Coast of North America and Inland Passages from Olympia, Washington, to Mount St. Elias, Alaska. Scale 1:1,200,000; price 50 cents. This map, the first edition of which was published in 1891, has been gradually filling up with details as surveys have progressed in this region.—Alaska Peninsula and Aleutian Islands; two sheets. Scale 1:1,200,000; relief expressed by hachures; price 50 cents.—Saint Michael's Bay, Alaska. Scale 1:20,000; relief expressed by con-

tours; photolithograph; price 50 cents.—Simonds Bay, Sitka Sound, Alaska. Scale 1:1200; relief by contours; photolithograph; price 10 cents.—Gambier Bay, Southeast Alaska. Scale 1:40,000; photolithograph; price 25 cents.—Mole Harbor, Southeast Alaska. Scale 1:20,000; photolithograph; price 25 cents.—General Chart of Alaska. Scale 1:3,600,000; relief is expressed by hachures; photolithograph; price 50 cents. This is a republication of the Coast Survey Chart of Alaska, which is gradually filling up with details as the work of exploration progresses.

The publications of the Hydrographic Office during the past year have been numerous, and we note particularly among them one new departure in the publications of that office, consisting of charts of the Great Lakes, compiled from charts of the United States Lake Survey, supplemented by revisions by naval officers. Among these the following may be mentioned:

Green Bay and Approaches, Wisconsin; price $1.25.—South Chicago. Scale 1:31,680; price $1.00.—Detroit River from Bar Point to Mamajuda Light House.—Pelée Passage, Lake Erie. Scale 1:15,000; price $1.50.—Georgian Bay, Lake Huron, from Parry Sound to French River; price $1.00.

Another departure is the republication from the work of the Coast Survey, of charts of the Atlantic Coast, of which the following have been issued:

Atlantic Coast from Bell Island to New York; price $1.00. The list of charts of foreign countries published by the Hydrographic Office is long. The titles of many of them are as follows:

West Coast of Vancouver Island from Barclay Sound to Nootka Sound. Copy from British Admiralty Chart; price $1.00.—Anchorages on the West Coast of Vancouver Island, Hecate Cove, Entrance Anchorage, Koprino Harbor, Stamp Harbor. Copy from British Admiralty Charts; price 25 cents.—West Coast of Lower California, from Abreojos Point to Cape San Lázaro. Relief expressed by contours; price $1.25.—Hospital Bight, Honduras Bay, Guatemala; price 50 cents.—Port Livingston and Approaches to Dulce River, Honduras Bay, Guatemala; price 75 cents.—Barranca and Supe Bays, Peru, from the British Survey. Relief by hachures; price 25 cents.—Santa Catharina Island, Brazil. Relief by hachures; price $1.25.—Esmeralda Cove, Chile; price 25 cents.—Lobos, Pescadores and Piojo Coves, Chile; price 25 cents.—Port Corral, Chile, from the Chilean Survey; price 25 cents.—Anchorages in Tierra del Fuego; price 25 cents.—Anna Pink Bay, Chile. Relief by hachures; from a British Survey; price 25 cents.—Port Low and Melinca,

Chile; price 50 cents.—Port San Pedro, Sheep and Small Coves and Port Montt, Chile; price 25 cents.—Huentelauquen Cove and River Maule Entrance, Chile; price 25 cents.—Vallenar Road and San Andres Bay, Chile; price 25 cents.—Anchorages in Patagonia, Chile, Port Chico, Port Choros and Port Grande; price 25 cents.—Anchorages between Gulf of Trinidad and Gulf of Peñas, Patagonia, Chile; price 25 cents.—Anchorages in Magellan Strait, from British Surveys; price 50 cents.—Anchorages in Magellan Strait; price 25 cents.—Table Bay, South Africa; from British Surveys; 75 cents.—Mersina Roadstead, Mediterranean, Asia Minor; price 25 cents.—Mitsukue Minato, Japan; from Japanese surveys; relief by hachures; price 25 cents.—Owashi Wan (Rodney Bay), Japan; from a British survey; relief by hachures; price 25 cents.—Pacific Ocean on Mercator's Projection, showing lines of equal magnetic declination; price $1.25.

Mount Desert Island, Maine. Scale 1:125,000. Compiled by Waldron Bates, Edward L. Rand and Herbert Jacques, 1896.

The topography and hydrography have been taken from the chart of the U. S. Coast and Geodetic Survey, relief being shown by contours, with intervals of 40 feet. There is little change from the original chart, except in the addition of roads, houses and place names.

Southern Alps of New Zealand, from the latest Government Survey, with additions by E. A. Fitzgerald. Scale 1 mile to 1 inch.

This map accompanies Fitzgerald's "Climbs in New Zealand Alps." It represents an area of the South Island of approximately 30 miles square, comprising a portion of the high mountain region, a region whose peaks reach to nearly 12,000 feet and whose higher valleys are filled by glaciers. Indeed, the extent of the glaciers in these mountains is surprising. The latitude is but 43° to 44° south, yet here glaciers extend downward to altitudes less than 2,500 feet, and several are of great length, Tasman Glacier being fully twelve miles long. Relief is expressed by shading.

Of the general map of the Netherlands, scale 1:125,000, 25 sheets have appeared. These show relief by hachures, and many cultural and cadastral details.

Of the great map of Austria-Hungary, on the scale of 1:75,000, 98 sheets have been issued. These show relief by hachures. A reduction of this map is being published on a scale of 1:200,000, on which relief is shown by crayon shading, and which represents the distribution of woodland. Of this 26 sheets have been issued.

Map of British Columbia, compiled by direction of the Chief Commissioner of Lands and Works, Victoria, B. C., 1895, scale 15 miles to one inch. Relief is expressed by crayon shading. This is probably the best map of British Columbia extant, embodying all that was known concerning the country at the time of publication.

The State Survey of Wurtemberg has issued three sheets bearing the names Cannstadt, Leonberg and Lorch. As in the other sheets of the series, the scale is 1:25,000, and relief is expressed by contours.

The Survey of Mexico has republished two of the three sheets heretofore issued. These are upon the scale of 1:100,000, and relief is expressed by contours at intervals of 50 metres. The work, especially in the mountain regions, has the appearance of being rather sketchy.

The French Survey of Tunis, carried on under the Service Géographique de l'Armée, has issued two sheets upon a scale of 1:50,000, on which relief is expressed by hachures.

The French Survey of Algeria, carried on under the same auspices as above, has issued fifteen sheets upon a scale of 1:50,000, in hachures, and four sheets upon a scale of 1:200,000, also in hachures.

The same Survey has issued maps of a large part of northern Africa, in seven sheets, upon a scale of 1:2,000,000. Relief is expressed by hachures. These maps represent much of the western half of the Sahara, and the forested region lying south thereof.

Bodensee Karte, scale 1:50,000; relief both of the land and of the lake bottoms is expressed by contour lines at intervals of 10 metres. This beautiful map in two sheets is the joint work of the neighboring states of Switzerland and Germany.

Ober-Engadin, scale 1:50,000. This map of a portion of the higher Alps shows the relief by means of hachures and contours with intervals of about 30 metres (about 100 feet). The expression of relief is very effective.

Schaffhausen, scale 1:25,000. Relief is expressed by contours at intervals of 10 metres, the region represented being a low rolling country.

Two sheets of the geological map of France have been issued, viz: Dijon and Castellane. The base of this geological map is the Staff map, upon a scale of 1:80,000, with relief expressed by hachures. Descriptive text accompanies the map.

The Geological Survey of Austria-Hungary has issued five sheets, the base of which is the military map, on a scale of 1:75,000; relief

is expressed by hachures. The colors upon some of these sheets might be criticised as being too heavy to allow easy reading of the topographic features.

Geologische Special-Karte des Grossherzogthums Baden in three sheets; scale 1:25,000. The relief of the base is expressed by contours.

Carte Géologique Internationale De l'Europe.

The International Geological Congress, which met at Boulogne in 1881, for agreeing upon a scheme of colors for use in representing the succession of geological formation, decided to prepare and publish a geological map of Europe to illustrate the use of this color scheme. The scale decided upon was 1:1,500,000, or very nearly twenty-four miles to an inch. The whole of Europe was to be constructed upon one projection, and this to be cut into rectangular sheets without regard to projection lines, each sheet being 488 millimetres high, and 546 millimetres broad. The plan contemplated 49 such sheets. The compilation of this map was placed in the hands of MM. Beyrich and Hauchecorne.

The topographic base, which is simply a drainage map, has been drawn by Prof. H. Kiepert, at Berlin, from the most recent materials, and has been lithographed in the Lithographic Institute of Berlin. The geological coloring is laid down, as far as possible, from the original geological maps of the various countries. This work has, however, been retarded greatly by the fact that many countries have undertaken a revision of their geological maps, being incited thereto by this project, and it was regarded as desirable to await the results of this revision.

Thus, although undertaken in 1881, it was only in 1894, thirteen years later, that the first part, comprising six sheets of the map, was issued. These six sheets comprise Belgium, the Netherlands, northern Germany, Russian Poland and Iceland. A second part, comprising five sheets, was issued in 1896. These include the Iberian Peninsula, with most of France and parts of Italy, together with the northern part of Algeria and Tunis, in Africa.

Upon this map forty-nine color distinctions are made. For Quaternary, Pliocene, Miocene, Oligocene and Eocene, light yellows are employed; for Cretaceous, green; for the Jurassic formations, blues; for the Trias, purples; Permian, browns; Carboniferous, grays; Devonian, browns again; Silurian, blue-gray; Cambrian, gray; Schists and Gneisses, shades of pink; for Granites, Porphyries and Trachytes, heavy reds are used; for Basalts, Diabases, etc.,

dark purples, and for volcanic matter, lava, tufa, cinders and scoria, oranges. The preponderance of heavy body tints in many localities, especially those where volcanic rocks abound, makes the map difficult to read. It is measurably deficient in datum points, since very little culture is shown, thus affording few points or lines for the location of the color areas.

One very important result flowing from the preparation of this map will undoubtedly consist in the correlation throughout large areas of geological formations which have never heretofore been properly identified.

Carta Idrografica del Bacino del Fiume Volturno e del Litorale fra i Fiumi Garigliano e Tusciano.—Carta Idrografica del Fiume Sele.—Scala di 1:250,000.

The above hydrographic maps of Italian river basins represent, besides the natural stream courses, the irrigation systems, springs of pure and of mineral waters, and a classification of the surface rocks, in accordance with their degree of permeability to water. Gauging stations and stations for the measurement of rainfall are indicated.

Carta delle Strade Ferrate Italiane 1897, redatta e pubblicata per cura dell' Istituto Cartografico Italiano.—Roma, Scala di 1:1,500,000.

A railroad map of Italy, showing the lines in operation, under construction, projected, etc.—The Italian Cartographic Institute has also issued a most elaborate progress map of its cadastral surveys, showing by departments on a scale of 1:1,000,000, by colors the progress made in each of the several operations of survey, from the trigonometric reconnoissance to the completion of the map and the classification of lands. These sheets before us show: in the Compartimento di Firenze, the Circoli di Ancona Firenze Pisa e Roma, and the Circolo di Cagliari; in the Compartimenti di Napoli, the Circoli di Bari e Napoli, and the Circolo di Palermo; the Compartimenti di Torino, Milano and Venezia. The work seems to have been completed for only a small portion of the kingdom.

Carta della Pianta di Roma, redatta su quella pubblicata per il Comune di Roma, dall' Istituto Cartografico Italiano. Scala di 1:8,000.

An excellent map. The scale is sufficiently large to show distinctly, without crowding, all essential details, including streets and street names, public and other prominent buildings, etc.

Schizzo Dimostrativo della Regione Compresa tra Massaua-Adua-Cassala. Scala 1:333,000.

This map, or sketch, as the title gives it, published by the Italian Cartographic Institute, represents an area of about 32,000 square miles in northeastern Africa, including much of the mountainous region of Abyssinia, in which the Italian troops were handled so roughly by the Abyssinians.

Relief is expressed by crayon shading, and routes of travel by red lines.

Die Grenzen der Unbekannten Polargebiete von A. Supan.

This map, which accompanies an article by Supan in *Petermanns Geographische Mittheilungen* for 1897, *Heft 1*, contrasts, upon a map of the Arctic regions, the present limits of the unknown in the Arctic and the Antarctic regions. This contrast may be summarized by the statement that the unknown regions about the two Poles are in area in the proportion of 5 to 21.4, *i. e.*, about the South Pole the unknown regions are more than four times as extensive as those about the North Pole. The unknown area about the North Pole is equal to that of European Russia, while that about the South Pole is in extent twice that of all Europe.

In the areas included by the limits of the unknown upon this map there is but one place where the Antarctic limits overlap the Arctic limits. Here for a space of about 30° of longitude the South Pole has been approached more nearly than the North Pole. This lies between longitude 164° west and 162° east. The unexplored area in the Antarctic at present is practically equal to the unexplored area in the Arctic two hundred years ago. During the past one hundred years the progress of discovery, as represented by the area redeemed from the unknown, has been somewhat greater in the southern than in the northern zone, both when measured in square miles and in advance toward the Pole. This, however, is an illustration rather of the backwardness of exploration in the Antarctic than of greater activity and success in that region.

Examining the line which separates the known from the unknown in the Arctic Ocean, we see that north of Asia a great breadth of the ocean has been explored, ranging in width from 15° to 5° of latitude, while north of North America, on the other hand, the limit of the unknown follows the coast very closely.

In Antarctic regions we find the limit of the unknown following, during most of its route, very closely a parallel of latitude, viz.: the Antarctic Circle. In two places notable advances have been

made beyond it, that by Wendell in 1829, who broke through in longitude 35° west to a point in approximate latitude 75°, and Ross in 1842, who in longitude 163° west reached a latitude exceeding 77°. These explorers seem to have been specially favored by open seasons, and thus were enabled to break through the ice barrier which other explorers have encountered.

BOOK NOTICES.

Publications of the University of Pennsylvania. Series in Philology, Literature and Archæology, Vol. VI. Researches upon the Antiquity of Man in the Delaware Valley and the Eastern United States. By Henry C. Mercer, Curator of the Museum of American and Prehistoric Archæology at the University of Pennsylvania, 1897. Ginn & Company, Agents for the United States, Canada and England, 9–13 Tremont Place, Boston, U. S. A. Max Niemeyer, Agent for the Continent of Europe, Halle a/S., Germany. (*To subscribers, $2.00.*)

The places explored by Mr. Mercer were: an argillite quarry and blade workshop in Bucks County, Pennsylvania; an Indian ossuary on the Choptank River, Maryland; aboriginal shell heaps on York River, Maine; a rock-shelter, known as the Indian House, in Bucks County, Pa.; and Durham Cave, in the same county.

The archæological specimens, known in England as Drift implements and in America as Trenton gravel specimens, *paleoliths*, or *turtle-backs*, are associated with the earliest stage of human development. Discussion has at last established a distinction, in comparison with which other criteria of age are insignificant; the distinction, that is, between those found in place in a geological stratum that proved their age, and those found on the surface.

With regard to the latter Mr. Mercer declares, on the evidence of sites examined in various parts of the United States, that the geologically modern Indian made, or could have made, them all.

The detailed account of the examination of the Argillite Quarry and Blade Workshop on the Delaware fills fifty pages, and reaches the following conclusion:

> . . . the remains found were, after all, scanty. All referred to the Indian. No token of an antecedent race was discovered, either on the exposed native rock, upon the hills above, or on the beaches below.

The ossuary on the Choptank River is referred to the end of the

17th century. There were two deposits, one about two feet below the other, and in the lower one many of the bones had been burned. No implement or trinket was found.

The shell heaps on York River were found to be practically identical with those in every part of the Atlantic seaboard from Nova Scotia to Florida. The upper accumulations are supposed to be not more modern than the latter half of the 16th century, while the lower portions may be older by several centuries. The vast antiquity assigned by some writers to the Brazilian and other shell mounds reported to contain fossil molluscs is, according to Mr. Mercer, the result of a misapprehension. He quotes the statement of Prof. Pilsbry, Conchologist of the Academy of Natural Sciences, Philadelphia, that not a single extinct *species* of mollusc has been found in the kitchen middens of Europe or America.

There were evidences of cannibalism in the York River heaps.

The Indian House rock-shelter furnished relics of the familiar Indian, but no trace of a cave man.

In the Durham Cave nothing was found to prove the geological antiquity of man, and, with one exception, the unfossilized bones discovered were those of still existing animals. The exception was a fragment of the jaw and vertebræ of the extinct peccary (*mylohyus pennsylvanicus*). Yellow and fresh-looking, the jaw and vertebræ presented no greater appearance of antiquity than the surrounding remains of recent animals, and all, while still fresh enough for food, had been gnawed by rodents. Mr. Mercer concludes that the animal in question became extinct within a few centuries.

These researches are marked by scientific method and accuracy and entire freedom from bias, and they are set forth in an attractive style.

The illustrations are many and very good, and the work is well printed, though the proof-reader has overlooked two or three errors, such as *quarternary* (p. 52) and *heterstropha* (p. 167).

Report on the Navigability of the Eastern Rivers of Peru. By Capt. M. Melitón Carvajal, of the Peruvian Navy. 8vo. Lima, 1896.

This little pamphlet of 12 pages is a translation of an article which originally appeared in the 4th trimestre of Vol. V of the *Boletin de la Sociedad Geográfica de Lima*, and was prepared at the request of the Consul-General of Sweden and Norway in Peru, acting as the representative of a Norwegian navigation company which was contemplating the establishment of a regular steamboat service on the fluvial system of Eastern Peru. The translation, if made by a

Spanish-speaking person, is quite creditable; if made by one born to the English tongue it is abominable. Omitting mention of renderings which are ludicrous, it will suffice to point out one as an example, involving ambiguity which is serious from the standpoint of a prospective navigator, where "*La corriente media de este trayecto puede estimarse en tres millas por hora*" is translated, "The river flows in this part at a middle rate of 3 miles per hour." Even the statement as given in the Spanish, referring to the Rio Marañon (or main Amazon) from Iquitos to Borja, is open to criticism. The average current-speed at Iquitos reaches this rate at low water and exceeds it during the frequent periods of flood, and in the Alto Marañon, especially above Barranca, where the channel becomes constricted by hills, it flows in the narrower portions at about 4 miles per hour, and attains a speed of nearly five miles in the vicinity of Borja, which is situated at the foot of the Pongo de Manseriche, the first cataract on the Amazon. For purposes of navigation, it is almost superfluous to say, a knowledge of average current-speed is of no value. It is the maximum speed, on reaches which must be traversed, that determines the conditions of navigation of any stream. The minimum depth on shoals seems to be given accurately with reference to all rivers, and hence the limits of navigability, as collated by Capt. Carvajal, should serve a useful purpose.

The accompanying sketch map, which is an exceedingly neat piece of cartography, reflecting credit both on the draughtsman, Max. Doig, and on the lithographic work of San Cristóval of Lima, demands attention on account of the large claims to territory which it makes for Peru, cutting generously into what is usually assumed to belong to Ecuador and Brazil. The irregular northern boundary, as drawn, includes the Rio Napo as far as Lake Capucuy, and the Ica (or Putumayo) to a little beyond Lake Arasari. The eastward prolongation follows latitude 7° 10″ south from the Javarý to the Madeira; thence southward up the Madeira and its branch the Beni, and then follows the Madidi. The dispute, of course, is an old one, some of the more important features of which, with some recent history, will be found in a paper by Dr. Claudio Osambela in the *Boletin de la Sociedad Geográfica de Lima*, Vol. VI, 1st trimestre. Capt. Carvajal, however, wisely leaves the rivers in all this contested territory alone, which is the part of wisdom in view of the uncertainties of boundary disputes.

DE KALB.

Through Unknown African Countries. The First Expedition from Somaliland to Lake Lamu. By A. Donaldson Smith, M.D., F.R.G.S., Honorary Member of the Academy of Natural Sciences, Philadelphia. Illustrated. Edward Arnold, Publisher to the India Office, London, 37 Bedford Street; New York, 70 Fifth Avenue, 1897. 8vo. Price $5.00.

Dr. Smith was moved to undertake his journey in Somaliland, he tells us in his first chapter, because he had an Anglo-Saxon love of sport and adventure, and seven years' medical training had taught him never to lose a chance of doing scientific work. The sportsman is more conspicuous in the book than the lover of science, but the latter did his part, and the appendices show a respectable list of contributions to natural history, geology and ethnography.

Dr. Smith started from Berbera in July, 1894, and marched in a southwesterly direction to a little beyond Ginea, where he was stopped by the Abyssinians. He turned to the east and southeast, then westward to Lake Rudolf, and thence south to Lamu, the end of his fifteen months' wanderings. His most interesting find was the tribe of pygmies, the Dume, in the region north of Lake Stefanie. The tribe numbers about a thousand, who raise sheep and goats and cultivate a little land. They hunt with poisoned arrows, though the area of their hunting ground has been diminished by the encroachments of their neighbors. Dr. Smith took no measurement of the Dume, for fear of alarming the little people, and this may be regarded as a lost opportunity.

He visited the Rendile, and his account of them agrees with that given by Mr. Astor Chanler. Here he found a mountain, called Marsabit, and on the top of it a lake, a mile square, surrounded by a forest. On one side was the semicircular wall of a crater, on the other a broad road to the open meadows beyond the forest. These meadows stretch for five miles, and to the west, beyond the plain, rises Kulol, and below that Mount Nyiro.

The greatest natural wonder described is the limestone formation, to which Dr. Smith has given the name of *The Caves of Wyndlawn.* These are on the river Web:

> Balustrades and peristyles, huge columns and arches, looking as though they had been cut and carved by the Cyclops from mountains of pure, white marble, broke the water's course and lined its shores . . . . We . . . passed under an arch and through a natural temple composed of a little group of columns of white translucent rock, supporting a roof of solid granite. When we emerged at the other side . . . . The whole mountain appeared to be resting on a series of columns thirty to forty feet high and twenty to eighty feet apart, between which were spacious vaulted

chambers, with their domes rising many feet higher; and then again many columns uniting formed long arched tunnels (pp. 84, 87*).

Dr. Smith is catholic in his tastes. He takes in and seems to feel the beauty of the landscape and the charm of the wilderness, and he left Africa not heart-whole:

. . . among others, a beautiful Arab girl,—but let us only take one good look at those splendid limpid eyes, *en passant*, and feel ourselves suffused with a warm glow, which remained in our memory like the charming rosy light of the sun setting over a savage country (p. 365).

At the same time he spares no detail of his prowess in killing game, and he takes a little recreation where few would find it:

It is very amusing to see crowds of Abyssinians about the carcass of a freshly killed animal, cutting off huge pieces of the quivering flesh, etc. (p. 77).

Interesting as the book is, it would have been improved, if Dr. Smith had submitted the manuscript to a judicious friend, armed with a blue pencil.

The maps, which give altitudes in feet and astronomical determinations of latitude and longitude from the author's observations, deserve special mention, and the illustrations are nearly all good.

Two well-known names are misprinted: on p. 2 that of M. d'Abbadie, and that of Prof. Heilprin, in a note on p. 84.

Irlande et Cavernes Anglaises par E.-A. Martel. Avec 121 Gravures, 18 Plans et Coupes et 3 Planches hors texte. Paris, Librairie Ch. Delagrave, 15 rue Soufflot, 1897. 8vo.

M. Martel has written a charming book, undertaken, he tells us, for two reasons: first, the happy result of his campaign of exploration in the caves of Ireland and England in 1895, which brought him into possession of a mass of information, much of it unpublished; and second, his admiration for the natural beauties and the archæological treasures of Ireland, both too little known to travellers.

The author does not discuss the political and social questions of the day, though he was present when the Conservatives won the contest of 1895, but he bears testimony to the orderly character of the people and to their general good behavior at that exciting time. He travelled in the west and in the south, encountering but few signs of the extreme destitution which is supposed to characterize those districts. He does not doubt that the country is poor, but he found comfort, as well as a kindly reception, wherever he went, and he comes to the fair conclusion that Ireland has been

* So numbered. A full-page illustration takes the place of pp. 85 and 86.

calumniated. The natural beauties of the island are familiar enough in description, and yet those who travel with M. Martel will see even the most familiar scenes in a new light.

Especially admirable are the two chapters, XV and XVI, devoted to the Coast of Antrim, which the author studied from Larne to Portrush, from the Cornice Road, worthy to be classed with those of the Alpes-Maritimes and the Crimea, to Dunluce Castle and the White Rocks. It is not only for the Giants' Causeway, he declares, but for the whole Antrim Coast that the traveller should go to Ulster.

The illustrations, which are extremely good, are from originals furnished by public institutions and private collectors.

The Journal of School Geography, edited by Mr. Richard E. Dodge, Associate Professor of Natural Science, Teachers College, New York City, has appeared monthly, this year, and is filled with information and suggestions for the common-school teacher of geography, in whose interests it is published. Mr. Dodge is assisted by an able corps of associate editors.

Elementary Geology. By Ralph S. Tarr, B.S., F.G.S.A., pp. xxx + 499. $1.40 net. Macmillan Co., New York, 1897.

In this volume Prof. Tarr has given us a very readable and interesting treatise concerning the elements of geology. It is, perhaps, the most attractive of the elementary text-books in geology capable of being used to profit in American schools.

Beginning with an introductory account, unfortunately a little meagre, of the various kinds of rocks, igneous, sedimentary and metamorphic, Prof. Tarr lays the foundations for an understanding of the surface features of the earth. In striking contrast to many elementary books, but following the dictates of common sense and of modern pedagogy, Prof. Tarr lays particular stress upon dynamical geology, believing that the youthful mind, perhaps for many years blind to the works of nature, can best be introduced to her mysteries through a study of processes which can now be seen at work. In the consideration of wind erosion, we regret that the author has not made more clear the effect of the sand-blast upon pebbles, thereby contrasting this erosive process with that of moving water, where again he fails to bring out clearly the story of the eroded pebbles.

In the chapter on under-ground water, a little more lengthy account might have been given of those interesting and important results known as limestone caves. Sufficient emphasis also has not

been given to the fact that water is to be found in the earth to the greatest depth to which mines have reached.

In the chapter on rivers and oceans, the author is to be complimented, though he might have devoted more attention to river meanders as illustrated in large rivers, such as the Mississippi. In considering river and lake deposits, the subject matter is good, though the paragraph on river deposits is, like most explanations of these deposits, meagre and not clear. The attention given to alluvial cones and deltas, to their influence upon river courses and history, is extremely good.

We regret that the author has paid so little attention to the characteristic forms of glacier deposits in his chapter on glaciers. The chapter would have been much improved if more attention had been given to drumlins, eskers, etc., of so much interest in certain parts of the United States.

In the question of mountains, the author does not go into sufficient detail, and he would have made his case more complete if he had considered other forms left by erosion than those he mentions, as, for instance, buttes. The chapter on volcanoes, earthquakes, and geysers is very good.

In the part of the book dealing with historical geography, we feel that the author has done well in not going into more detail concerning the study of fossils. It cannot be thought that one short paragraph devoted to the topic of evolution is enough for this fundamental conception in science.

As a whole the book has a good deal in its favor, and some things must be said against it. In many cases the explanations lack definiteness and detail, and the number of terms given is too small to enable a pupil to make use of geological literature. On account of the commendable popular tone in which it is written, the pupil might feel that he had gained a very complete knowledge of geology. To leave him in such a state of mind would be an unfortunate thing on the part of the teacher. In many parts of the book more illustrative instances might very well have been given. The author has failed in some cases to make clear the exact place of which he is talking. For instance, the limits to the earth jar, described on page 353, would not, perhaps, be clear to a Western reader. There are a few errors in the book, the most important of which is that on page 293, where the author has, by a slip, confused normal and reverse faults. The illustrations are exceedingly well chosen and, as a whole, well executed, though two of the best pictures in the book, Plate 4 and Figure 86, are so blurred

as to be comparatively unintelligible. The diagrams, which are numerous, are clear-cut, but the perspective is not good, and in most cases the reader does not get a conception of distance. They look as though they were to represent sections of small models rather than views of large areas. This criticism is applicable to all the diagrams bringing in perspective that we have noted.

In conclusion it may be said that the book is one that will find many uses and be of great help in making scientific geology and physiography intelligent and interesting. It is not a book, however, that could be used alone in the elementary preparation of pupils for professional work, and therein lies its weakness. In most high schools and normal schools, especially where the teacher has but little knowledge of out-of-doors and little knowledge of geology apart from that gained from text-books, this treatise will be of great assistance. Prof. Tarr has written his book to appeal to a special audience and a large one, and he will probably succeed. From the standpoint of the writer, therefore, there is little criticism to offer. It is to be regretted, however, from the scientific standpoint, that an author who is so successful in writing to a popular audience, should not be more inclined to lead his readers into untrodden fields, and thereby advance the cause of science.

R. E. D.

Rocks, Rock-Weathering and Soils. By George P. Merrill, Curator of Geology in the United States National Museum. The Macmillan Co. 8vo, 411 pp. Price, $4.00.

This is one of the most useful and satisfactory manuals that has appeared in recent years, possessing as much interest for the geographer as for the geologist. The author has summarized a wide range of facts with such care and fullness of references as to make the book valuable to the special student. Nor has he neglected the general reader, who will find simple and precise explanations of the things which he wishes to know about soils and the rocks from which they are derived. Part I deals with rocks in general, their chemical elements, constituent minerals, physical properties and mode of occurrence. Part II deals with the classification and description of the chief kinds of rocks,—aqueous, igneous, æolian and metamorphic. The author states that the work is not a petrology, but that the study of rocks is simply introductory to the rest of the volume. There is, perhaps, no other work which so well defines the variations and limitations in the use of many terms commonly applied to rocks and rock structures. The account of clays, given

on pages 135–139, affords an excellent illustration. Part III treats of the weathering of rocks, by the atmosphere, its gases, changes of temperature and winds, by the chemical and mechanical action of water, and by organisms. Suitable emphasis is here put upon many phenomena which often receive scanty treatment, as notably the destructive effects of temperature changes and of solution. An interesting chapter is devoted to the physical manifestations of weathering. Certain channel ways for rivers and inlets in Canada are due to the decay of dikes, as cited from Professor Bell. The formation of granite domes by weathering is explained, and Stone Mountain, Georgia, 2 miles long and 650 feet high, shown in Plate 1, is a noteworthy illustration, which should take the geographer's eye and interest him in the inquiry for the causes of land forms. Water channels in caverns, and rolling contours due to solution of the underlying rocks, are described in this connection. Time considerations are then taken up, with treatment of the rate of weathering as due to texture and composition, humidity, position, and to warm and cold climates. The closing part treats of the Regolith, a term which the author proposes for that great blanket of unconsolidated drift and residual material which covers the hard, rocky crust of the globe. The regolith is composed (1) of sedentary material, including the residuum from leaching of soluble matter, and accumulations, in place of organic débris; and (2), transported material, glacial, æolian, alluvial and colluvial, the last term being applied to talus and cliff débris. These varieties are fully described and that superficial film of the regolith known as soil, receives valuable treatment under the heads—chemical nature, mineral composition, physical condition, weight, kinds, color, age and effects of organisms. Analyses of type rocks and soils are numerous throughout. There are also 25 full-page plates, 42 cuts in the text and an author's and a subject index.

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Note.—NEW YORK STATE SCIENCE TEACHERS ASSOCIATION.—On December 30 and 31, 1896, the newly organized New York State Science Teachers Association met at Syracuse. The attendance was large and the interest and enthusiasm were great. One session was devoted to a discussion of the Earth Sciences for secondary schools. The subject was opened by a paper prepared by Prof. R. S. Tarr of Cornell University, read by Dr. F. M. McMurry of Buffalo. Prof. Tarr advocated the teaching of physiography in the first year of

the high-school course, believing that this subject, taught in the modern way, is more helpful than any other in awakening the minds of pupils. He spoke very strongly for more concentrated work in some one division of science in the secondary schools, and scored most forcibly the so-called "fourteen weeks" in science. He believed that science could be made to give as valuable training as any other branch of knowledge, if rightly taught.

The second paper was by Prof. Richard E. Dodge of the Teachers College, New York City, who spoke from the standpoint of the trainer of teachers in geography for the grade schools. He outlined the course that would, to his mind, best prepare the students for an appreciation of geographic features. Such a course should include meteorology, geology, physiography and the application especially toward some particular continent.

Following the second paper discussion in five-minute speeches, no one speaking a second time, occupied two hours.

At the closing session it was voted that the President appoint a committee of nine to consider the present status of science teaching in New York State, with suggestions for improvement, to report at the next meeting. In this committee, it is expected that the earth, biological and physical sciences, will be equally represented. A new board of officers, with Prof. E. L. Nichols of Cornell University as President, was elected for the ensuing year. Prof. Franklin W. Barrows of 45 Park St., Buffalo, is Secretary and Treasurer, and will be glad to answer any inquiries.

Note.—The Royal Society of Canada announces that it will hold a meeting at Halifax, Nova Scotia, June 21–26, 1897, to commemorate the discovery of the Atlantic Coast of Eastern North America by John Cabot in 1497.

An appropriate brass tablet will be placed with due ceremony by the Royal Society in the Legislative Building, now the oldest structure of the kind in the oldest maritime city of the region first seen by the famous Italian navigator.

Invitations have been extended to the Corporation of the City of Bristol, from which Cabot sailed in *The Matthew*, to notable geographical and historical societies in Europe and America, as well as to the City of Venice, and it is expected that a number of distinguished gentlemen will be present at the meeting of the Society.

ACCESSIONS TO THE LIBRARY.

JANUARY–MARCH, 1897.

BY PURCHASE.

Beni Hasan, by F. Ll. Griffith, Part III (Archæological Survey of Egypt), London, 1896, 4to; Dictionary of National Biography, edited by Sidney Lee, Vol. 49, London, 1897, 8vo; A Breath from the Veldt, by John Guille Millais, London, 1895, 4to; Impressions d'Egypte, par Louis Malosse, Paris, 1896, 8vo; Hand Atlas über alle Theile der Erde, von Adolf Stieler, Gotha, 1896, folio; A Dictionary of Islam, by Thomas Patrick Hughes, 2d Edition, London, 1896, 8vo; Travels of a Pioneer of Commerce in Pigtail and Petticoats, by T. T. Cooper, London, 1871, 8vo; Journal of the First French Embassy to China, 1698–1700, translated by Saxe Bannister, London, 1859, 12mo; The Past and Future of British Relations in China, by Captain Sherard Osborn, Edinburgh and London, 1860, 8vo; Portuguese Discoveries, Dependencies and Missions in Asia and Africa, compiled by A. J. D. D'Orsey, London, 1893, 8vo; My Second Journey Through Equatorial Africa, etc., by Hermann von Wissmann, translated by Minna J. A. Bergmann, London, 1891, 8vo; Queen Moo and the Egyptian Sphinx, by Augustus Le Plongeon, London, 1896, 8vo; Travels through France and Italy, by Tobias Smollett, 2d Edition, London, 1766, 2 vols., 8vo; The Jesuit Relations and Allied Documents, the original French, Latin and Italian Texts, with English Translations and Notes, edited by Reuben Gold Thwaites, Cleveland, 1897, Vols. 3 and 4, 8vo; History of the City of Troy, N.Y., by A. J. Weise, Troy, N. Y., 1876, 8vo; History of the City of Albany, New York, by A. J. Weise, Albany, 1884, 8vo; Life of Samuel F. B. Morse, by Samuel Irenæus Prime, New York, 1875, 8vo; Life and Death of John of Barneveld, etc., by John Lothrop Motley, New York, 1874, 2 vols., 8vo; Notes on the History of Slavery in Massachusetts, by George H. Moore, New York, 1866, 8vo; South African Traits, by James Mackinnon, Edinburgh, 1887, 8vo; Report on the Old Records of the India Office, etc., by Sir George Birdwood, 2d Reprint, London and Calcutta, 1891, 8vo; "Where Chineses Drive," English Student-Life at Peking, by a Student-Interpreter (T. A. D.), London, 1885, 8vo; Fifteen Thousand Miles on the Amazon and its Tributaries, by C. Barrington Brown and William Lidstone, London, 1878, 8vo; Reports of the Geological Survey of Alabama for 1874, 1875, 1876, 1879 and 1880, Eugene A. Smith, State Geologist, Montgomery, Ala., 1875–1881, 4 vols., 8vo; Historical Record of the City of Savannah, by F. D. Lee and J. L. Agnew, Savannah, 1869, 16mo; West African Stories, by A. B. Ellis, London, 1890, 8vo; The Making of a Nation, 1783–1817, by Francis A. Walker, New York, 1895, 12mo; Final Report of Investigations among the Indians of the Southwestern United States, Carried on mainly in the Years from 1880 to 1885, by A. F. Bandelier, Part II, Cambridge, 1892, 8vo; Catalogue of the Library of E. G. Squier, edited by Joseph Sabin, New York, 1876, 8vo; Geschichte der Isländischen Geographie, von Th. Thoroddsen, übersetz. August Gebhardt, Leipzig, 1897, Band I, 8vo; Lights and Tides of the World, etc., James F. Imray and W. H. Rosser, London, 1869, 4to; Narrative of a Nine Months' Residence in New Zealand in 1827, by Augustus Earle, London, 1832, 8vo; Anadol: the last Home of the Faithful, by (James Henry Skene), London, 1853,

8vo; Austral Africa, Losing It or Ruling It, by John Mackenzie, London, 1887, 2 vols., 8vo; Theory of Heat, by J. Clerk Maxwell, London, 1872, 8vo; Every Day Life in China, by Edwin J. Dukes, London, 1885, 8vo; Four Years in Ashantee, Ramseyer and Kühne, New York, 1875, 8vo; Eastern Pilgrims: The Travels of Three Ladies, by Agnes Smith, London, 1870, 8vo; With Axe and Rope in the New Zealand Alps, by George Edward Mannering, London, 1891, 8vo; Almanack, 1897, Joseph Whitaker, London, 1897, 8vo; Enlarged Alpine Club Map of the Swiss and Italian Alps: 3 miles = 1 inch, London, 1881, folio, 8 sheets; Oceana, or England and her Colonies, by James Anthony Froude, New York, 1886, 8vo; A Topographical Dictionary of Great Britain and Ireland, by John Gorton, London, 1833, 3 vols., 8vo; Feudal and Modern Japan, by Arthur May Knapp, Boston, 1897, 2 vols., 16mo; William Penn's Journal of his Travels in Holland and Germany in 1677, London, 1835, 8vo; Life of William Dewsbury, etc., by Edward Smith, London, 1836, 8vo; Zoological Results of the Two Expeditions to Western Yunnan in 1868 and 1875, by John Anderson, London, 1878, 2 vols., Text and Plates, 4to; Annual American and English Catalogue, 1896, New York, 1897, 8vo; Russian Travellers in Mongolia and China, by P. Piassetsky, translated by J. Gordon-Cumming, London, 1884, 2 vols., 8vo; The West Indies and the Spanish Main, by J. Rodway, London, 1896, 8vo; The True Life of Capt. Sir Richard F. Burton, by Georgiana M. Stisted, London, 1896, 8vo; The Mameluke or Slave Dynasty of Egypt, 1260–1517 A. D., by Sir William Muir, London, 1896, 8vo; Where Three Empires Meet, by E. F. Knight, 2d Edition, London, 1893, 8vo; A Geographical History of Mammals, by R. Lydekker, Cambridge, 1896, 8vo; The Zambesi Basin and Nyassaland, by Daniel J. Rankin, Edinburgh and London, 1896, 8vo; Seventeen Trips through Somáliland, etc., by Captain H. G. C. Swayne, London, 1895, 8vo; Mountaineering and Exploration in the Japanese Alps, by Rev. Walter Weston, London, 1896, 8vo; Journal of the Right Hon. Sir Joseph Banks, during Captain Cook's First Voyage, etc., edited by Sir Joseph D. Hooker, London, 1896, 8vo; At the Court of the Amir, by John Alfred Gray, London, 1895, 8vo; The Great Rift Valley, etc., by J. W. Gregory, London, 1896, 8vo; The Ancient Ways: Winchester Fifty Years Ago, by Rev. W. Tuckwell, London, 1893, 8vo; Aspects of Modern Oxford by a Mere Don, New York, 1894, 8vo; Polar Gleams: an Account of a Voyage on the Yacht Blencathra, by Helen Peel, Chicago, 1894, 8vo; The Life of Sir Harry Parkes, by Stanley Lane-Poole and F. V. Dickins, London, 1894, 2 vols., 8vo; La Jeune Amérique: Chili et Bolivie, par André Bellessort, Paris, 1897, 8vo; Dahomé, Niger, Touareg: Notes et Récits de Voyage, par le Commandant Toutée, Paris, 1897, 8vo; The American Catalogue, 1890–1895, edited by R. R. Bowker, New York, 1896, 4to; Farthest North: Being the Record of a Voyage of Exploration of the Ship "Fram," 1893–96, etc., by Dr. Fridtjof Nansen, New York, 1897, 2 vols., 8vo; Geographisches Jahrbuch, Hermann Wagner, XIX Band, 1896, Gotha, 1897, 8vo; The Moravians in Labradôr, 2d Edition, Edinburgh, 1835, 12mo; The Decline of the Roman Republic, by George Long, London, 1864–74, 5 vols., 8vo; Burmah, its People and Natural Productions, by F. Mason, Rangoon, 1860, 8vo; The Boundary Disputes of Connecticut, by Clarence Winthrop Bowen, Boston, 1882, 4to; Our Vice-regal Life in India, etc., by the Marchioness of Dufferin and Ava, London, 1889, 2 vols., 8vo; The Genesis of Queensland, by Henry Stuart Russell, Sydney, 1888, 8vo; Bokhara: Its Amír and Its People, translated from the Russian of Khanikoff, by Baron Clement A. de Bode, London, 1845, 8vo; Among the Selkirk Glaciers, etc., by William Spotswood Green, London, 1890, 8vo; Observations on the Geology and Zoology of Abyssinia, by W. T. Blanford, London, 1870, 8vo; Madagascar, an Historical and Descriptive Account, etc., by Samuel Pasfield Oliver, London, 1886, 2 vols., 8vo; Townsend Harris, First

American Envoy in Japan, by William Elliot Griffis, London, 1895, 8vo; L'Ile de Chypre, etc., par L. de Mas Latrie, Paris, 1879, 16mo; Catalogue of the Manuscript Maps, Charts, and Plans, and of the Topographical Drawings in the British Museum, London, 1844, 2 vols., 8vo; Africana; or the Heart of Heathen Africa, by Duff Macdonald, London, 1882, 2 vols., 8vo; The Rise of our East African Empire, by Capt. F. D. Lugard, London, 1893, 2 vols., 8vo; Fridtiof Nansen, 1861–93, by W. C. Brögger and Nordahl Rolfsen, translated by William Archer, London, 1896, 8vo; Journeys in Persia and Kurdistan, by Mrs. Bishop (Isabella L. Bird), London, 1891, 2 vols., 8vo; Letters and Sketches from the New Hebrides, by Maggie Whitecross Paton, London, 1895, 8vo; Memories of Mashonaland, by G. W. H. Knight-Bruce, London, 1895, 8vo; The Africander, by E. Clairmonte, London, 1896, 8vo; Alone with the Hairy Ainu, etc., by A. H. Savage-Landor, London, 1893, 8vo; The Kafirs of the Hindu-Kush, by Sir George Scott Robertson, London, 1896, 8vo; My Çlimbs in the Alps and Caucasus, by A. F. Mummery, London, 1895, 8vo; Round the Black Man's Garden, by Zélie Colvile, Edinburgh and London, 1893, 8vo; The Hansa Towns, by Helen Zimmern, London, 1889, 8vo; With Captain Stairs to Katanga, by Joseph A. Moloney, London, 1893, 8vo; Among the Tibetans, by Isabella L. Bishop, London, 1894, 8vo; With Wilson in Matabeleland, by Captain C. H. W. Donovan, London, 1894, 8vo; The Relief of Chitral, by G. J. and Frank E. Younghusband, London, 1895, 8vo; Twenty Years in Khama's Country, etc., by Rev. J. D. Hepburn, edited by C. H. Lyall, London, 1896, 8vo; The Glacial Nightmare and the Flood, by Sir Henry H. Howorth, London, 1893, 2 vols., 8vo; From Edinburgh to the Antarctic, by W. G. Burn Murdock, London, 1894, 8vo; Advance Japan: A Nation thoroughly in Earnest, by J. Morris, London, 1896, 8vo; Life in Normandy (by J. F. Campbell), Edinburgh, 1863, 2 vols., 8vo; Life in the Mission, the Camp and the Zenáná; or Six Years in India, by Mrs. Colin Mackenzie, London, 1854, 2 vols., 8vo; A Tour performed in the Years 1795–6, through the Taurida, or Crimea, etc., etc., by Mrs. Maria Guthrie, etc., etc., London, 1802, 4to.

BY GIFT AND EXCHANGE.

From the State Reservation at Niagara, Albany, N. Y.:

Reports of the Commissioners of the State Reservation at Niagara for the Years 1885–1887, 1889–1895. 11 vols.

From the University of the State of New York, Albany:

State Library Bulletin, Legislation No. 7, December, 1896; Extension Bulletin, No. 16, October, 1896, 489 Books of 1896.

From the Société de Géographie d'Alger, Algiers:

Bulletin, Première Année, IIe Fasc., Juillet–Décembre, 1896.

From J. H. De Bussy (Pub.), Amsterdam:

De Indische Mercuur, 19 Jaargang, 1896, Nos. 51, 52; 20 Jaargang, 1897, Nos. 1–12.

From the Naval Institute, Annapolis, Md.:

Proceedings, Vol. 22, 1896, No. 4.

From Edward Arnold, Publisher, New York:

Through Unknown African Countries, by A. Donaldson Smith, London and New York, 1897, 8vo.

From the Oficina General de Informaciones y Canges, Asunción, Paraguay:

Revista Mensual, Tomo 1, Nos. 9–10, 1896, No. 11, 1897; Ley de Papel Sellado y Estampillas con su reglamentación.

From S. P. Avery :

Lettre du 31 Jan. 1642, René Descartes (en facsimilé), MS.; Nouvelles Recherches sur les Premières Rédactions du Voyage de Marco Polo, Par M. Paulin Paris (Paris), 1850, pr., 4to.

From Francis M. Bacon :

Korean Repository, Seoul, Vol. III, No. 11, Nov. 1896; Vol. IV, No. 1, Jan. 1897.

From the Instituto Geographico e Historico, Bahia :

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Miscellaneous Collections: No. 1071, Air and Life, by Henry De Varigny, M.D., Sc.D.; No. 1072, The Atmosphere in Relation to Human Life and Health, by Francis Albert Rollo Russell; No. 1073, The Air of Towns, by Dr. J. B. Cohen; No. 1075, The Constants of Nature, Part V, A Recalculation of the Atomic Weights, by Frank Wigglesworth Clarke, New Edition, 1897; No. 1077, Equipment and Work of an Aero-Physical Observatory, by Alexander McAdie; Annual Report of the Board of Regents of the Smithsonian Institution, July, 1894.

From the Department of State, Washington:

Consular Reports, No. 195, Dec., 1896; Nos. 196, 197, 198, Jan.–March, 1897; Special Consular Report, Vol. XIII, Part II, Money and Prices in Foreign Countries.

From the Weather Bureau, Washington:

Monthly Weather Review, November and December, 1896, and January, 1897; Annual Summary for 1896.

From the American Antiquarian Society, Worcester, Mass:

Proceedings at the Annual Meeting, held in Worcester, October 21, 1896; Roll of Membership of the American Antiquarian Society, with a List of Officers, January, 1897.

TRANSACTIONS OF THE SOCIETY.

JANUARY–MARCH, 1897.

The Annual Meeting of the Society was held at Chickering Hall, Tuesday, January 12, 1897, at 8.15 o'clock P. M.

President Daly in the chair.

The following persons, recommended by the Council, were elected Fellows of the Society:

Prof. J. M. Jameson. Thos. J. Long.

The Annual Report of the Council was then presented and read:

To the American Geographical Society:

The Council respectfully submits the following Report for the year 1896:

The number of Fellows on the 1st of January was 1,149. In all 23 Fellows were elected during the year. The diminution in number by death, resignation, etc , is 103, and the total membership on the 31st of December was 1,069, of whom 284 were Life Fellows.

The Council has again the pleasure of congratulating the Society on the satisfactory condition of its finances. The Treasurer's Report shows that the income of the Society was $16,797.39. and the ordinary expenditures were $11,008.91, leaving a surplus of $5,788.48, of which $4,000.00 have been added to the Building Fund and invested, as are the other surplus funds of the Society, in bonds secured by mortgages on property in New York, Brooklyn and vicinity, guaranteed by Trust Companies in whose solvency the Council has full confidence.

In the matter of providing a fire-proof building for the collections of the Society, the Council is unable to report progress.

After mature consideration the design for the Cullum Geographical Medal, submitted by Miss Lydia Field Emmet, was adopted, and the sinking of the die has been entrusted to Mr. Victor D. Brenner. The Council, on the 5th of December, 1896, by unanimous vote awarded the first impression of this medal to Civil Engineer R. E. Peary, U. S. N., for his expedition of the year 1892, which determined the insularity of Greenland.

The additions to the Library number 3,544, viz.: Books, 723: Pamphlets and Periodicals, 2,596; Atlases, 14; Maps and Charts, 211.

All of which is respectfully submitted.

(Signed) HENRY PARISH,
Chairman.

NEW YORK, Jan'y 2, 1897.

The Report of the Treasurer was then presented and read:

REPORT OF THE TREASURER FOR THE YEAR 1896.

NEW YORK, January 1, 1897.

To the American Geographical Society:

The Treasurer respectfully reports the following Receipts and Expenditures of the Society for the year ending December 31, 1896:

The balance in the Union Trust Co., January 1, 1896, was		$14,069 49	
The Receipts have been:			
Dues	$7,620 00		
Interest	9,001 39		
Sale of Publications	176 00		
		16,797 39	
			$30,866 88
The Expenditures have been:			
House Account	$497 24		
Salaries	5,169 00		
Library	1,293 95		
Lectures	728 50		
Publications	2,217 06		
Stationery and Postages	411 76		
Insurance	228 00		
Legal Expenses	420 00		
Miscellaneous	43 40		
		$11,008 91	
Paid for guaranteed mortgages on property in New York, Brooklyn and vicinity		17,200 00	
			28,208 91
			$2,657 97
There has also been received—			
Interest on Cullum Medal Fund	$203 12		
and expended on same account	100 00		
			103 12
There remains on deposit in Union Trust Co., January 1, 1897			$2,761 09
of which $629.19 belongs to the Cullum Geographical Medal Fund.			

(Signed) WALTER R. T. JONES,
Treasurer.

The Committee charged with the duty of selecting candidates for the offices to be filled made the following Report:

REPORT OF THE NOMINATING COMMITTEE.

To the American Geographical Society:

The Committee appointed by the Council on the 5th of December, 1896, to nominate suitable persons to fill the offices which will become vacant in January, 1897, respectfully recommend the election of the following gentlemen:

For President—CHAS. P. DALY, LL.D., term to expire January, 1898.

For Vice-President—W. H. H. MOORE, term to expire January, 1900.

For Treasurer—WALTER R. T. JONES, term to expire January, 1898.

For Foreign Corresponding Secretary—WILLIAM LIBBEY, term to expire January, 1900.

For Councillors—FRANCIS H. BACON, AUSTEN G. FOX, ALEXIS A. JULIEN, S. NICHOLSON KANE, D. O. MILLS; terms to expire January, 1900.

(Signed) CHARLES A. PEABODY, *Chairman*,
HENRY HOLT,
CHANDLER ROBBINS,
Nominating Committee.

NEW YORK, January 2, 1897.

On motion, duly seconded, Mr. Clinton Roosevelt was authorized to cast the vote of the Society for the candidates and they were declared duly elected.

The President then introduced Civil Engineer R. E. Peary, U. S. N., and addressed him as follows:

LT. PEARY: Our late Vice-President, General Cullum, in addition to his munificent bequest to the Society of $100,000 towards the erection of a fire-proof building for the security of our fine geographical library of 27,000 volumes, left by his will a further sum to found in the Society a gold medal to be called "*The Cullum Geographical Medal*," for the awarding by the Society, from time to time, of a gold medal to those "who distinguish themselves by geographical discoveries, or in the advancement of geographical science, *particularly citizens of the United States*," and the proceeds of the fund invested for the purpose having reached a sum sufficient to make the first award of the gold medal, the Council, at its meeting last December, passed a resolution unanimously that the first gold medal issued by the Society should be awarded to you for your geographical discoveries in the Arctic, namely:

1. The delineation of the unknown coast of Inglefield Gulf;

2. The delineation of the imperfectly known coasts of Whale and Murchison Sounds;

3. The determination of the rapid convergence of the northern shores of Greenland above the 78th parallel; which established the insularity of Greenland. From Independence Bay to Cape Bismarck, a stretch of about 100 miles, you could not then explore, owing to difficulties which no human effort could overcome.

The outline of the northern coast of Greenland, as it now appears upon the map, is the result of your enterprise.

This, in the history of Arctic exploration, is no ordinary achievement. Dr. Petermann, the founder, proprietor and editor of the great German geographical journal that bears his name, maintained for years, and to the day of his death, that Greenland was a large continent extending over and beyond the pole. I never believed in that theory, as you know, having conversed with you on the subject before you ever went to Greenland, for the reason that three-fourths of the polar circle as then known was an archipelago of islands and if, in the absence of knowledge, we were to indulge in conjecture it was more reasonable to suppose that the remaining fourth would prove to be the same; and this, by the three discoveries that I have enumerated, and especially that of the *rapid convergence* of the northern shores of Greenland, you have established to be the fact.

The Council have signified their appreciation of the importance of this geographical discovery by their unanimous vote that the first gold medal of the Society shall be awarded to you. Our librarian, in communicating to you officially the unanimous conclusion of the Council, took occasion, you will remember, to express his opinion that of all persons now living you were the one most entitled to our gold medal with one exception, and that exception was—Mrs. Peary.

Some one may say, Well, if this has been ascertained, what is the use of it? The answer to which is that it is important that every part of the globe that is unknown should become known if it is possible without considering in advance what the knowledge may lead to. But a better answer is that familiar one of Franklin's to the same question: He replied: "What is the use of a child? make it of use."

The distinction you have acquired will remain a lasting possession to you and to yours, and the lines addressed to La Pérouse may not less fitly be applied to you:

Fair Science on the ocean's azure robe,
Still writes his name in picturing the globe.

Judge Daly then presented the medal to Mr. Peary, who made his acknowledgment in the following address:

Mr. President:

There is a long hiatus between this and the college trophies which I won in the boat race, at throwing the ball, and in walking, and I never dreamed that my ability to get over the ground would in the future win such a magnificent prize as this, the first gold medal of the most conservative Geographical Society of the world I remember now, in looking at this yellow disk, that when a boy I read a little book containing cuts and descriptions of the various medals awarded my predecessor, Dr. Kane, of the United States Navy, and yet I never thought of anything of the kind in connection with my own work. What I have done has been done for the pure love of doing, and so the award of this medal, coming unsought, unexpected, and best of all, by the unanimous vote of the Council, is ten-fold pleasing. One of man's God-given attributes is the desire to know more, and thousands of eager minds and bodies are constantly at work widening our horizon. Fortunately for us, too, tastes differ here as elsewhere, and each line of investigation has its devotees. There is the astronomer, with his telescope, and his mathematics, reaching out into infinite space; Le Verrier, projecting his mind into space, noting the perturbations of the planets, grasping the meaning, determining the cause, then saying to astronomers: Point your powerful telescope to such a place in the heavens and you will see a new planet. There is the physical investigator with his countless experiments, his delicate apparatus; Roentgen with wizard skill discovering at last a way to look through opaque objects. I have the greatest admiration, amounting practically to awe, for these men, but there is only one man in a century capable of such achievements, and in contemplating his almost supernatural work one is troubled with a chill, disagreeable fear that, perhaps after all, the coming man may be simply a toothless, baldheaded case for abnormally developed gray matter; taking his food in the shape of pellets, and perhaps taking his pleasures and propagating his species in the same way; and the longing comes over us to remain young and retain the pure animal life of primal man as long as possible.

But to the man of ordinary intellectual calibre and good physique, possessing something of primal man's love of freedom and contact with nature, there is another field of discovery open—that of the explorer. What better than dowered with good blood, strong lungs and strong muscles, as the explorer must be, with every breath a pleasure and every step a source, Antæus-like, of new strength to find and traverse new lands, to add to our knowledge of the world we live in, and obtain information of value to mankind? There is a constant intoxication in such work, in the thought "my eyes are the first that have ever looked upon this scene, mine the touch that has wakened the sleeping princess." Every one of you who is, or has been a mountain climber, knows this feeling. Everywhere, whether in the tropics, the temperate zone or the Arctic circle, this feeling holds possession of the traveller, and yet it seems to me as if the purely personal effect is stronger in the north than anywhere else. The midnight sun, the noonday night, equally unapproachable in sublimity; the dazzling brilliance, the universal darkness, the inky sea, the snowy land, the mighty bones of mother earth beneath the feet, the infinite heaven, unbroken, uninterrupted above the head; the crystalline air, biting, it is true, but pure as the celestial ether; the infinite

silence, the indescribable desolation, touch and keep in vibrant unison the highest, grandest, noblest, purest chords in human nature. Mr. President, you and the members of the American Geographical Society have been my firm, consistent friends from the day when I presented to you my first project for Greenland exploration, and you endorsed it and gave tangible proof that you meant the endorsement.

My work has determined what Sir Clements Markham, president of the Royal Geographical Society, characterized as one of the oldest and most interesting Arctic problems, the insularity of Greenland, and I am more than glad that it has substantiated the views you have always held that the land of the inner polar circle must be in the form of detached islands, groups, rather than a great Arctic continent, as was urged by the great German geographer, Petermann.

Mr. President and members of the Geographical Society, I thank you from the bottom of my heart for this high honour.

There will be in the future many contestants who will strive for the prize, and win glory for themselves and the Society. And the name of the Society, linked with that of its revered Vice-President, Gen. Cullum, will be more and more widely known, and in the families and among the descendants and friends of the fortunate recipients of the medal shall be household words for generations to come.

And now, Mr. President and members of the Society, as this seems a particularly fitting and appropriate time to speak of the future, I beg your indulgent attention for a few minutes.

History has been made rapidly in the Arctic regions in the past few years and is apt to be made still faster in the next few. My own reconnoissance of the Greenland Inland Ice in 1886 was followed by Nansen's crossing of the country in 1888. Then came my two expeditions of 1891 to 1895, in each of which I crossed the northern portion of the Great Ice Cap from Whale Sound to Independence Bay and the northern terminus of main Greenland; reaching an unknown portion of the east coast and settling the question of the insularity of the Great Arctic Island. Simultaneously with my second expedition started the expeditions of Wellman to the Spitzbergen region, Jackson to Franz Josef Land, and Nansen into the great blank of the Siberian Arctic basin.

Now, all of these expeditions but one have returned, leaving untouched or unfinished several of the most interesting problems of the North.

Nansen has wrested from the Stars and Stripes the record of highest north which it had held for a dozen years and placed the Norwegian flag far in advance. He has also shown that the entire segment of the polar basin north of the Siberian coast is not available for further poleward efforts. Jackson is still in Franz Josef Land, but with all my admiration for the pluck and energy of this gallant Englishman and the free-handed generosity and public spirit of his patron, Mr. Harmsworth, I fear that conditions are against him, now that it is established that Franz Josef Land is merely an archipelago of limited extent with no land north of it. My own expeditions have satisfied me that from a sufficient depot of provisions and equipment located in the latitude of Independence Bay the Pole is attainable. The results of these various expeditions have shown that there is left but one practicable route by which to attain the North Pole, and that route the one that has been known as the American, viz., the route through Smith Sound, Kane Basin, Robeson Channel, and along the northwest coast of Greenland. This route has been developed almost exclusively by Americans—Kane, Hayes, Hall and Greely. The Pole is certain to be reached soon; it is only a question of time and money and not so very much of the latter; and unless we are alert we shall be left in the rear. I propose for your consideration now in

the simplest and fewest possible words a safe, common-sense project for reaching the Pole by the only remaining practicable route. I have no theory to advance (the polar regions are peculiarly hostile to theories); therefore, I have no long array of arguments to marshal. I have to present simply a plain statement of facts. The conquest of the North Pole, the complete delimitation of the Greenland Archipelago, the last of the circumpolar island groups, and the elimination from our maps of the unknown area between the 84th parallel and the Pole, are important geographical desiderata. This work can be accomplished without risk of life or health. It can be done at a comparatively small cost. The time for this work is favorable; the probabilities of success flattering; the requisite experience and inclination to undertake it available. The one element lacking is the necessary funds. My plan in fewest words is to raise a fund sufficient to insure the continuation of the work of exploration for ten years, if necessary, say $150,000, and deposit it in a trust company; purchase a ship; give her a minimum crew; load with concentrated provisions; proceed to Whale Sound; take on board several picked families of my faithful Eskimos, with their tents, canoes, dogs, etc.; force a way through Robeson Channel to Sherard Osborn Fjord or farther, and land people and stores; then send the ship back. As soon as the freezing of the ice in the great fjords of the northwest coast would permit sledge travel, the work of advancing supplies northeastward along the coast would be commenced, taking comparatively short stages and light loads so that the trips could be quickly made. As soon as the supplies had been advanced the first stage, the party itself would move forward, leaving a cache behind, and as they would be following Eskimo customs and living in snow houses, this could easily be done. Then the second stage of advance would be taken up, and the work carried on until the departure of the sun. Each of the brilliant winter moons of the polar night would afford opportunities for continuing it, so that early spring should find the party and the bulk of its supplies located at the northern terminus of the North Greenland Archipelago, probably not far from the 85th parallel, with caches behind it at each prominent headland. From this point, when the proper time came, with picked dogs, the lightest possible equipment, and two of the best of the Eskimos, the dash for the Pole would be attempted with strong probabilities of a successful termination. Should the first season be unfavorable as regards ice conditions, it could be devoted to a detailed survey of the archipelago itself and a reconnoissance of the east coast as far south as possible, and the northern journey reserved for the following season, or the next. Each succeeding summer the ship would attempt to establish communication with the party's base, succeeding probably every other year at first, then, with increasing experience, every year, and keep up its supply of food, dogs and Eskimos until the objects of the expedition were accomplished. Should the ship be unsuccessful in the passage of Robeson Channel the first year, the party would land at Hayes Sound, and devote the first year to explorations of that unknown region. Retreat from the colony at Sherard Osborn Fjord would always be practicable across the inland ice to Whale Sound.

Here let me call your attention to a few points on which you must accept my dictum, as I have no time to enlarge.

Arctic exploration may be regarded as safe. This is shown by the experience of the last ten years. Nothing is to be gained by numbers; in fact, numbers are a distinct danger, and the frightful catastrophes of previous work are, in my opinion, directly traceable to that cause. The entire animus of the Arctic regions is against large parties. Where three men will get along in safety and comfort, six would merely exist on half-rations and twelve die of starvation. The two-man party is the ideal one; both Nansen and myself have proved this.

The leader of the expedition must be at the head of the advance party; no successful Arctic party can be led from the rear.

The latitude of Lockwood and Brainard's farthest north is 83 degrees 24 minutes. The distance from this point, up to which we know there is land, to the Pole and return, is less than the distance from Whale Sound to Independence Bay and return, which I have twice covered, once with a single companion, and again under the heaviest handicap.

Quite likely the question comes up: "If this method is so practicable, why has not the establishment of a base in this locality been attempted before? and why have I not attempted it myself?" It has been attempted before, but there being no means for a continued effort, failure in the first attempt has resulted in its abandonment. As for myself, it has been entirely a question of money. The funds at my disposal have not permitted the charter of a ship beyond Whale Sound.

The points in favor of this project are:

1. The utilization of the Eskimo, the people best fitted in the world for that particular kind of work, men who, under the leadership of one whom they know to be their friend, and in whom they have the utmost confidence, would follow to the end, faithful and loyal as their own magnificent dogs. What could be more effective, more practical, than a party, its rank and file made up of the children of the North Pole itself, a surgeon for emergencies, and a leader to furnish will, intelligence and direction? According to the theory of Sir Clements Markham, President of the Royal Geographical Society, the forefathers of these people, centuries ago, during the migration of the tribe from Siberia to its present home, may have crossed unknowingly the apex of the earth. What a striking coincidence if their children should be the instruments of wresting the secret of the Pole!

2. Land for a base. The party launched into the icy waste from the Northern Archipelago, would have some definite, fixed point to which to return, rather than a ship drifting with the drifting ice, to vanish like a will o' the wisp, as did the *Fram* from Nansen. Then should the party be swept westerly in its retreat, it would still strike land, and finding depots at each prominent headland, could easily reach headquarters.

3. A practicable and already utilized route for a retreat independent of the ship or outside assistance.

In a nutshell my project means:

First: The raising of a sum sufficient to insure persistent, continued effort so that if the attempt fails the first year it can be repeated the next, and the next, and the next until it is done.

Second: The establishment of a party of picked Eskimo families, a surgeon and an experienced leader at the highest practicable point on the northwest coast of Greenland; with ample supplies; means of communication, which would enable the colony to sustain itself until its work is accomplished, and with a practicable line of retreat entirely independent of the ship.

This project in more detail and accompanied by maps will be placed before your Council in the belief that it will meet the approval and endorsement of the Society. With that endorsement, I believe the time is opportune for raising the money for the work. There is not a man or woman here to-night whose heart would not thrill with patriotism to see the realization of this project and know that it was American money, intelligence, energy and endurance that had scaled the apex of the earth and lighted it with the American flag. And no man could (simply by the expenditure of a few thousands, à la Henry Grinnell or Baron Dickson or Mr. Harmsworth, without exer-

tion or personal discomfort) obtain a more royal and imperishable monument than to have his name written forever across the mysterious rocks and ice which form the setting for the spinning axis of the globe—the North Pole.

The Cullum Geographical Medal is the work of Miss Lydia Field Emmet. On the obverse is the figure of a young man standing in the bow of a boat. He has thrown down his oars upon discovering land. He shades his eyes with his hand as the boat progresses through the waves. A sea gull, hovering, indicates the proximity of land. The whole is supposed to represent enterprise and the spirit of exploration. Inscribed on the face of the medal is: "The American Geographical Society of New York."

The reverse, to typify achievement and award, bears a female figure—Columbia, the left hand resting on a globe and the right holding out a laurel wreath. Beneath the right arm is a tablet to bear the record of the achievement for which the award is made. On this side is the inscription, "The Cullum Geographical Medal."

The President then introduced the speaker of the evening, Mr. F. S. Dellenbaugh, who read a paper on Coronado's March from Mexico to the Missouri, 1540–1542.

On motion, the Society adjourned.

A Regular Meeting of the Society was held at Chickering Hall on Monday, February 8, 1897, at 8.30 o'clock P.M.

Vice-President Tiffany in the chair.

The following persons, duly recommended, were elected Fellows of the Society:

Wm. Agnew Paton, Dr. Leander, J. Chamberlain.

The Chairman then introduced Mr. F. H. Newell, of the U. S. Geological Survey, who read a paper on Irrigation and its Effects upon Geography: the author of the paper, Mr. H. M. Wilson, being confined to his room in Washington by a serious illness.

On motion, the Society adjourned.

REPORT OF THE COMMITTEE APPOINTED FEBRUARY 6TH, 1897, TO CONSIDER AND REPORT UPON A SCHEME FOR POLAR EXPLORATION SUBMITTED BY R. E. PEARY, U. S. N.

To the Council of the American Geographical Society.

GENTLEMEN:

Your Committee, having examined and considered Mr. R. E. Peary's project of polar exploration, respectfully report that they find it clearly stated and well reasoned, and in their judgment, (so far as men not personally familiar with the con-

ditions of Arctic life can be supposed to form a judgment), practicable and worthy of support.

In itself and keeping in view the objects sought to be attained—the added distinction to be won for America, and the increase of knowledge among men—and the chances of success, the attempt is one that ought to be made.

Considering Mr. Peary's rare experience and his remarkable qualifications of energy, prudence, tenacity and fitness for command, it must be regarded as a singular advantage for his country that he stands ready to undertake the task for which his natural gifts and his acquirements have fitted him beyond other men.

Your Committee submit, and recommend for adoption the following resolution:

Resolved, that the Council of the American Geographical Society heartily approves the project of polar exploration laid before it by Civil Engineer R. E. Peary, U. S. N., and will gladly contribute towards the expense of the same, provided such contribution is needed and will be acceptable, and that other subscriptions, sufficient to warrant the undertaking, are secured by Mr. Peary.

Respectfully submitted,

BANCROFT GHERARDI,
CHARLES P. DALY,
CHANDLER ROBBINS,
} *Committee.*

NEW YORK, February 20, 1897.

A Regular Meeting of the Society was held at Chickering Hall on Monday, March 8, 1897, at 8.30 o'clock P.M.

President Daly in the chair.

The following persons, recommended by the Council, were elected Fellows of the Society:

Chas. B. Gunther, James McKeon,
W. C. Van Antwerp.

The President then introduced Mr. William Niven, who described his exploration of the ruined city of Omitlán, in the State of Guerrero, Mexico, and threw on the screen a number of illustrations taken on the spot.

On motion, the Society adjourned.

OBITUARY.

James Mühlenberg Bailey, a Life Fellow of the Society since the year 1869, and since 1870 a member of the Council, died at his home in New York on the 27th of February, 1897. He was Foreign Corresponding Secretary from 1873 to 1876, and from the latter year until his death he held the office of Domestic Corresponding Secretary. His interest in the work of the Society was active, until the failure of his health in recent years.

Mr. Bailey inherited a fortune, which enabled him to gratify his cultivated tastes. He travelled extensively in Europe, and his collection of rare engravings was well known among art lovers.